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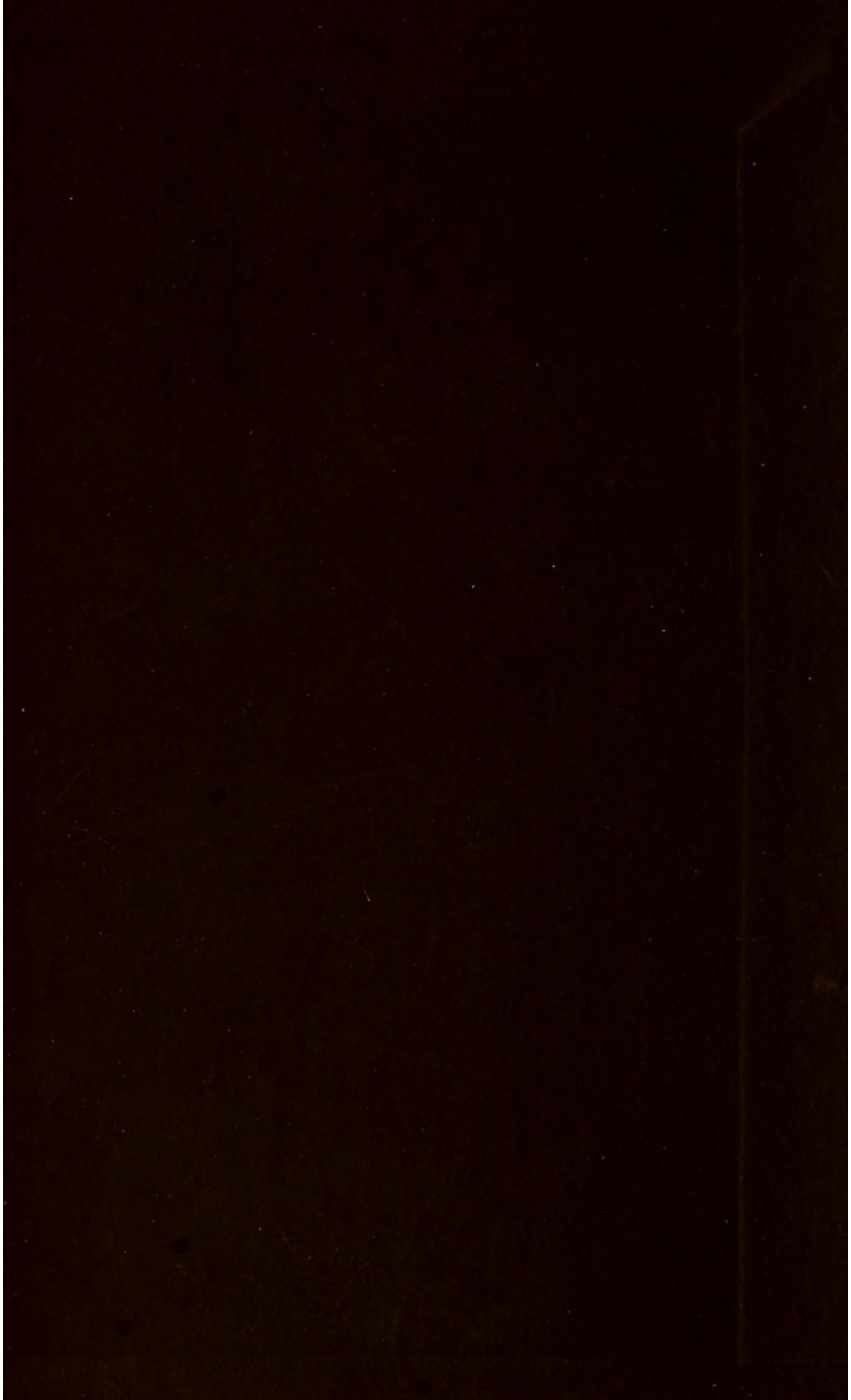

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THE

PRINCIPLES OF SURGERY.

BY

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TO WHICH ARE APPENDED

HIS TREATISES ON "THE DISEASES OF THE RECTUM," "STRICTURE OF THE URETHRA AND FISTULA IN PERINEO," "THE EXCISION OF DISEASED JOINTS," AND NUMEROUS ADDITIONAL CONTRIBUTIONS TO THE PATHOLOGY AND PRACTICE OF SURGERY.

EDITED BY HIS FORMER PUPIL,

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EDITOR'S PREFACE.

In compliance with a request, which had frequently and urgently been pressed upon me by professional brethren in different parts of the United States and Canada, I addressed a communication to Professor Syme, in December last, in which it was proposed that an unadulterated edition of his surgical works should be published on this side the Atlantic. At the same time I informed him that an American edition, in which great liberties had been taken with the original text, had already been published under the auspices of a certain fraternity calling themselves the "Eclectic School of Medicine," and which had consequently never been recognized by the regular members of the profession. To this Professor Syme replied: "As to your proposal of republication in America, I have long desired that what I have written should be known in a pure form, and will therefore feel much obliged by your undertaking the task."

Having thus stated the circumstances and authority under which the following volume is presented to the profession in America, there remains but little of a prefatory nature to be said.

Of Professor Syme's professional character, and his labors as a Teacher and Practitioner of Surgery, I might say much, if this were the proper place to do so, and if I felt myself in any way competent to do justice to such a subject. As it is, I will content myself with quoting here the words of a much older pupil of the Professor, one

who was a pupil more than thirty years ago, and who has since attained to great eminence, not only in the profession, but also in the world of letters. I refer to Dr. John Brown, of Edinburgh, well known on this continent as the author of "Spare Hours," to whom all of Professor Syme's old pupils feel deeply grateful for having, with so much accuracy and eloquence, given expression to their sentiments and opinions regarding his and their "old master and friend," of whom he says that "everywhere personally, professionally, and publicly, reality is his aim and his attainment. He is one of the men—they are all too few—who desire to be on the side of truth rather than to have truth on their side, and whose personal and private worth are always better understood than expressed. It has been happily said of him that he never wastes a word, a drop of ink, or a drop of blood, and his is the strongest, exactest, truest, immediatest, safest intellect, dedicated by its possessor to the surgical cure of mankind, I have ever yet met with. He will, I firmly believe, leave an inheritance of good done and mischief destroyed, of truth in theory and practice established, and of error in the same exposed and ended, such as no one, since John Hunter, has been gifted to bequeath to his fellow-men.

"As an instrument for discovering truth I have never seen his perspicacity equalled. His mental eye is achromatic, and admits into the judging mind a pure white light, and records an undisturbed, uncolored image, undiminished and unenlarged in its passage; and he has the moral power, courage, and conscience to use and devote such an inestimable instrument aright."

Of the following volume the first and largest part is devoted to "The Principles of Surgery;" those principles which have been taught in Professor Syme's lectures, and which have guided his practice throughout his long and brilliant career. The remainder is of a somewhat varied description, and comprises numerous special

treatises on subjects of great practical importance, as "Stricture of the Urethra," "Diseases of the Rectum," "The Excision of Diseased Joints," etc. Also, under the head of "Clinical Observations," will be found a record of numerous very interesting cases, accompanied by valuable practical commentaries.

The object aimed at has been the association in one volume, with his "Principles," of the most valuable of the author's numerous special contributions to the pathology and practice of Surgery.

In conclusion, I beg to state that for the selection that has been made of these contributions, and for their arrangement in this volume, I alone am responsible.

DONALD MACLEAN.

KINGSTON, C.W., October, 1865.

PREFACE.

THE great advance which has taken place in all the departments of medical science renders almost any one of them a sufficiently extensive field of study for an ordinary degree of intelligence. But some teachers, seeming to forget that their pupils are not to be mere anatomists, chemists, physiologists, or botanists, endeavor to inculcate all the knowledge which they possess with regard to their respective subjects of tuition. Professional education thus becomes an effort of memory rather than a process of mental training—so that brilliant examinations may be passed without any real practical information having been acquired. The Medical Council lately called attention to the evils which proceed from this system of overteaching, and especially to its leaving no time for observation or reflection. It is, therefore, to be hoped that a distinction may be drawn between the cultivation and teaching of medical science; and that while the former, in all its details, is carried to the utmost extent of human ability, the latter will be confined to what is requisite for the instruction of students. The

following work will, it is hoped, be found consistent with these views. It was the text-book of my systematic course, and contains the principles which I have endeavored to illustrate in my clinical lectures during the last thirty-four years. In its composition my aim has not been to collect all that might be said in regard to each subject, but rather to select what seemed of most importance, and arrange it in a convenient order for teaching or study, so as to constitute a framework of surgical science, which might be filled up through the gradual acquisition of professional knowledge.

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PRINCIPLES OF SURGERY.

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PRINCIPLES OF SURGERY.

CHAPTER I.

INFLAMMATION.

Introduction.

With exception of the cuticle and its appendages, the nails and hairs, all the solid part of the human body is composed of vascular tissues, which consist of blood-vessels and nerves interwoven together through a basis of cellular substance. These tissues are everywhere permeated by the blood, which supplies them with nourishment for their growth and renovation. Some of them, as those of which the bones and ligaments are formed, seem to perform no living action, but that of duly appropriating the nutritious matter thus afforded, so as to preserve their structure in a healthy or perfect state, and this is named their Nutritive Action. Other tissues, as the muscular and glandular, in addition to the power of nutrition, possess various remarkable vital properties, which are named their Functions.

Both the nutritive and functional actions of the tissues are subject to disorder. When the former are perverted, alteration of the structure necessarily results, as is seen in the growth of tumors or the formation of ulcers; but the latter may be disturbed without any obvious change of this kind, as when the digestion of food or the secretion of urine is imperfectly performed, without any perceptible difference in the stomach or kidney. Derangement of function, however, is most frequently connected with alteration of structure, and very apt to lead to it. Disordered action, whether of function or nutrition, constitutes Disease, to remedy which is the object of Medicine.

As the field of medicine is thus very extensive, it has been

divided into Physic and Surgery,—the former department comprehending chiefly internal complaints, while the latter includes those which are situated externally, or require for their treatment the use of external means. The art of Surgery consists in the performance of the various manual duties required in the employment of these means; while the science of Surgery directs their choice and application.

In the diseases which constitute the surgical department of medicine,—if we except those depending on the introduction of foreign substances, the retention of secretions, and the presence of concretions in the cavities and canals of the body,—there is always alteration of structure, which may be owing either to morbid nutrition, or to external violence. In both cases, reparation is to be effected, not by mechanical art, but by the action of the nutrient vessels; and all that the surgeon can do, is to remove obstacles impeding their salutary operation. When he speaks of healing a wound, for instance, he means nothing more than placing the part concerned in the most favorable circumstances for undergoing this reparatory process. It is therefore necessary, in entering upon the study of Surgery, to become acquainted with the various actions of these vessels, whether tending to the injury or reparation of structure. And as it very generally happens, that there is interposed, between the natural actions and those alterative of the structure, a diseased condition, which has been named Inflammation, this must be considered in the first place.

Symptoms of Inflammation.

By Inflammation is understood that condition of a part in which it is red, swelled, hot, and painful, along with more or less fever or constitutional disturbance. But there is still another circumstance of this morbid state, which, though it was not formerly so much noticed, is really the most important of the whole; that is, perversion of the vital action in the part affected, which is truly essential, and never-failing,—while the other symptoms are extremely variable in their degree, and not even constant in their existence. Inflammation may therefore be defined as a perverted action of the capillary system, generally attended with heat, redness, and swelling.

Redness.—This symptom is owing to distention of the vessels which convey blood; to blood being admitted into those which usually appear to receive only the colorless part of it, whether this be owing to the red globules not entering at all, or only so few at a time as to conceal their color, since it is only when existing in considerable assemblages that they appear red; and also to bloody effusion into the interstices of the structure concerned. Inflammation of the conjunctiva affords one of the best examples of these changes.

The redness varies considerably in shade. It is generally bright and florid, like that of arterial blood, but it often has a yellow hue, and still more frequently is dark, or almost purple. The yellow tinge is most frequently observed along with derangement of the biliary secretion, as in erysipelas; but the dark color depends on different circumstances, the discrimination of which is of great importance in practice. It was formerly thought a certain indication of putrid tendency, or proneness to die from weakness, and an unquestionable call for administering wine, bark, and cordials. It is now observed to depend frequently on obstruction of the respiratory function, preventing the blood from undergoing its proper change. It is seen also when the venous circulation of an inflamed part is impeded.

Swelling.—This symptom depends partly on the enlargement of the vessels, but chiefly on effusion of the serous or albuminous parts of the blood, or the blood itself, into the cellular texture. It consequently varies with the vascularity and laxity of the tissue concerned. Thus inflammation of the conjunctiva is attended with great swelling, while that of the cornea is accompanied by hardly any.

Heat.—This is a very characteristic symptom of inflammation, and, together with the redness, has no doubt led to the choice of a title for expressing it, since in all languages the term used for this purpose denotes burning. Like the last-mentioned symptom, the sensation of heat varies with the part affected. It is most remarkable in the skin, and in some parts of the mucous membrane, as the urethra.

It was formerly believed that the patient's feeling of heat depended always on a real and proportionate elevation of temperature; but the application of a thermometer at once proves this

opinion to be incorrect. John Hunter investigated the subject, and came to the following conclusions: 1. That the heat of an inflamed part is not commensurate with the patient's feelings. 2. That it does not exceed the standard or central heat of the individual. 3. That the greatest increase of temperature takes place in those parts which are furthest from the center, and naturally coldest. Thus inflammation of the scrotum, induced by laying open the tunica vaginalis, raises the thermometer from 92° to 98°. But if the disease elevates the general heat of the individual, the temperature of the inflamed part rises to the same degree, as in erysipelas, where the heat of the inflamed skin is frequently 104°.

Pain.—This is one of the most constant symptoms of inflammation. It is generally proportioned to the violence of the disorder and the sensibility of the part affected; but there are many exceptions to the latter part of this rule; and some tissues, as those of the osseous and fibrous kinds, which are not all sensible in their healthy state, occasion the most acute suffering when inflamed. The sensibility of every part in the body is increased by inflammation; and if this has ever been denied, it must have been from confounding insensibility to those stimuli which require, for making an impression, that the organ to which they are applied should perform a functional action for their reception, with insensibility to chemical and mechanical stimuli, which always excite more sensation when applied to an inflamed part than to one in a healthy state. Thus during inflammation the eye may be unfit for vision, while the impression of light produces a painful effect. The pain of inflammation varies in kind as well as in degree; being sometimes hot and burning, as in the skin and mucous membranes, at other times sharp and cutting, as in the serous membranes, or dull and aching, as in the bones.

It is impossible, in the present state of our knowledge, to account for these varieties in the pain, or even for the existence of pain at all. It is usually ascribed to the swelling that accompanies inflammation, causing pressure on the extremities of the nerves, whence it is said the most compact tissues occasion the severest pain; but this explanation is not satisfactory, as many which possess the softest and most yielding structure excite excruciating pain when they are inflamed, of which the mucous membranes afford a remarkable example.

The pain is not always felt at the part affected, but often at a distance from it, as at the point of the penis when the bladder is inflamed, in the right shoulder during inflammation of the liver, or in distant parts of the limb when the joints are the seat of disease. We are sometimes able to account partly for this by the nervous communications, but more frequently it is quite inexplicable, though highly deserving of attention in a practical point of view.

Derangement of Functional Action.—This symptom of inflammation cannot, of course, attend the inflammation of every tissue, and must be confined to those which possess some vital property in addition to that of mere nutrition. It is sometimes, however, the only symptom present, or at least the only one that can be recognized; as when the organ affected is contained in an internal cavity. When the function of the organ is to receive the impression of some external stimulus, as that of the eye or the nose, it is performed either imperfectly, or not at all; and hence, as already observed, some have been led into the error of supposing that the common sensibility of parts is diminished during inflammation.

Derangement of Nutritive Action.—In addition to the serous and bloody effusions into the cellular texture, which always take place to more or less extent, the most frequent indication of a change in the action of the nutritive apparatus is softening of the tissue concerned. In some cases this alteration is so remarkable, that it has been thought necessary to designate it by a peculiar expression, viz., *ramollissement*. This effect of inflammation is, on many occasions, of great importance, but at present deserves attention chiefly as affording evidence that the nutritive process is not performed in its usual manner. Another fact which leads to the same conclusion is the rapidity with which putrefaction proceeds after death, in parts where inflammation has previously existed. It may be said that the more than usual proportion of fluids congested by the diseased action may account for this speedy decomposition, without supposing that the constituent particles are altered by it in their relation to each other. But, in such a view of the matter, we ought to observe the same putrefactive tendency equally strong in parts where blood has been simply effused into their texture, which is not the case.

Constitutional Disturbance.—The disturbance of the system, or Fever, as it is called, which accompanies inflammation, consists of an alteration in the performance of all the functions of the body. The phenomena, which are in consequence exhibited, vary very much, according to peculiarities of the patient's constitution, and the part which is inflamed. Generally, the pulse is hard and frequent, beating from 80 to 120, and in children much faster,—the respiration is hurried,—the face is flushed,—the eyes are suffused,—the tongue is white and loaded,—there is no appetite,—inordinate thirst,—headache,—constipation,—scanty urine,—dryness of the skin,—confusion of ideas or delirium,—and prostration of strength in the voluntary muscles. This state of general disturbance, which is named Inflammatory or Symptomatic Fever, does not always accompany inflammation, and is usually proportioned to the violence of the local symptoms. Its type or character also varies, as already mentioned, according to the part or patient affected. The pulse may be small, feeble, and irregular or intermittent,—the tongue brown, smooth, and glazed,—the countenance dark colored, contracted, and anxious. These varieties in the symptoms of fever demand great attention, as indications of the seat and degree of the local disorder, and as guides for directing the remedial measures. The state of the blood, also, in this condition, requires particular consideration.

When blood is taken from one laboring under inflammatory fever, instead of coagulating as usual into a homogeneous red tremulous mass, it throws up to the surface a clear transparent fluid, which coagulates into an opaque buff-colored, tough, membranous-looking crust, which is named the buffy coat. It is usually about a quarter of an inch thick, and presents a concave surface, owing apparently to preserving its original extent, while the subjacent part of the clot contracts during the separation of the serum. Whatever hastens the coagulation of the blood tends to prevent the formation of the buffy coat. Thus weakness of the individual,—smallness in the quantity of blood abstracted,—exposure of it to an extensive surface of dead matter,—and its being abstracted in a small stream or by drops, all oppose the appearance in question. The formation of the buffy coat has therefore been supposed to depend merely upon slowness of coagulation, allowing the red particles to descend, and leave the fibrinous portion pure; but

there is certainly something more than this concerned in the process, since the tough yellow crust under consideration differs materially in appearance from the fibrinous mass which is obtained by washing away the coloring matter of healthy coagulated blood, and when the disposition to its production is strong, it takes place notwithstanding the most rapid coagulation; while blood drawn from an animal in health may be retained for a long time fluid, without showing any trace of it. The constituent proportion of fibrine seems to be actually increased, and there is a preternatural tendency to its separation from the blood, both while it circulates in the vessels, and after it is withdrawn from the body. The buffy coat, though very generally, is not invariably, observed during inflammatory fever; and it also appears occasionally, though no inflammation exists. Pregnancy, and violent agitation, whether of body or mind, are apt to cause its formation.

Inflammation terminates in various ways. Sometimes all the symptoms disappear, and the part resumes its natural condition, when it is said to terminate in Resolution. At other times it ends by destroying the life of the part; and is then said to terminate in Mortification. It also terminates in various actions, producing alteration of the structure, or the separation of matters from the blood, differing in quantity or quality from those naturally secreted by it. Of these the most remarkable are the following: The formation of a peculiar fluid named Pus, which is called Suppuration,—the Effusion of serum, or lymph, *i.e.* the fibrine, in a state resembling the buffy coat,—the removal of solid or fluid parts of the body, which is named Absorption,—and the production of some solid structure, differing in quantity or quality from that naturally existing, which may be designated Diseased Nutrition.

Inflammation has been variously divided and named, according to its termination,—the predominant local, and constitutional symptoms,—the degree of its violence,—and the part affected. Most of these distinctions, so far from simplifying the subject, have tended greatly to obscure and perplex it. Instead of causing inflammation to be regarded as a morbid action, always of the same nature, and merely modified in its symptoms and termination, according to the part and constitution affected, they have made it appear a group of dissimilar processes, arranged

under one title, but widely and essentially different from each other.

Inflammation of particular organs and tissues is expressed in modern nomenclature by adding the termination *itis* to the anatomical title of the part affected, as Iritis, Gastritis, Phlebitis. For some parts the old and peculiar appellations are still retained, —as Erysipelas for inflammation of the skin, Ophthalmia for that of the eye.

The severity of the symptoms also requires to be distinguished; for which purpose the terms Acute and Chronic are employed to denote the two extremes of violence, while the intermediate degrees are indicated by qualifying epithets. Acute inflammation frequently passes into the chronic; but the latter often exists independently and originally. When the inflammation is acute, it terminates one way or another in a few days at furthest, and sometimes even in a few hours; but when chronic, it may exist for weeks or months with little change. With acute inflammation there is almost always accompanying fever; but with chronic hardly any.

Causes of Inflammation.

The causes of inflammation, or circumstances which give rise to this morbid state, are very numerous and various. They may be divided into those which act directly on the part affected, and those which do so through the medium of the system.

The direct causes of inflammation, or local irritants, as they are usually called, comprehend all the natural stimuli of action when excessive in degree or continuance; various animal, vegetable, and mineral matters, such as cantharides, croton oil, and tartrate of antimony, which are named irritants from their effects; and every sort of violence, whether chemical or mechanical, which alters the structure of the body.

The effect of these causes varies with the irritability or tendency to excited action of the part or patient. Parts are generally irritable in proportion to their vascularity and sensibility. Thus the iris is more readily excited to inflammation than the cornea. But there are many exceptions to this rule; and particular tissues are most under the influence of particular irritations. The urinary bladder, for instance, is irritated by disten-

tion; and the joints by forcible extension of their ligaments. Parts occasionally become more irritable than usual. The circumstance of having been previously irritated sometimes renders them so. Weakness or diminished power of action, also, as from interruption of either the nerves or blood-vessels, or any other cause, contrary to what one might expect, produces the same effect. Habit, or the continued exposure to an irritation, lessens its effect.

The differences observed in constitutional irritability are very striking and important. Sometimes they seem to depend on original or congenital peculiarities of the system; but very frequently proceed from the injurious effect of deviations from propriety in diet or exercise. They are also often connected with mental irritation, which has a powerful influence over the irritability of the body. In these different states of the system, the same local irritation produces the most opposite effects; and while one individual may have his limb lacerated and the bone shattered without suffering so much inflammation as to occasion symptomatic fever, another dies from the intense action excited by the prick of a pin. The common expressions of a good and bad constitution are nearly equivalent to the possession of little or much tendency to suffer irritation from causes of disturbance; and the difference in this respect, as has been already observed, may either depend upon congenital peculiarity, or be acquired through circumstances connected with the mode of life.

A most important fact in relation to the effect of irritation is, that it generally proves inconsiderable when another which had been previously in existence, and exciting disturbance, is removed by its means. The success of operations frequently depends on this principle, as when amputation is performed on account of a diseased joint, which has kept up excitement for a considerable time without too greatly reducing the patient's strength.

The indirect causes of irritation, or those which act through the medium of the system, constitute a difficult, but very interesting and highly necessary subject of study. One of the most remarkable differences between animals and vegetables is the mutual dependence of the component parts of the former. Though each part is induced to act by particular stimuli, and produces peculiar effects, the whole are so connected together that one can hardly

be affected without causing more or less disturbance of others. Sometimes the whole system suffers, and then fever results; at other times the consequent disorder is confined to a part merely. This fellow-suffering, whether partial or general, is usually expressed by the term Sympathy. Various explanations have been offered to account for it, of which the following are most deserving of notice: 1. The anastomosis of Blood-vessels, as that of the epigastric and mammary arteries, to which has been attributed the fellow-suffering of the uterus and mamma; 2. Continuity of Texture, as that of the conjunctiva and lining membrane of the nose, to which the sneezing caused by exposing the eyes to a bright light has been referred; 3. Nervous Communication, as that between the phrenic and cervical nerves, which has been supposed to account for pain being felt in the shoulder when the liver is inflamed; 4. The Medium of Sensation, as when stimulants applied to the nose cause sneezing, though they do not induce this effect during insensibility; 5. Participation in the same function, as when the breasts become painful in the early months of pregnancy. None of these explanations admit of general application in accounting for sympathy; and many cases of it are not explicable by any of them. But though the cause of sympathy is at present, and probably ever will be, beyond the reach of human understanding, the facts which are generally observed in regard to its manifestations are fair subjects of inquiry, and of the utmost importance in practice. Of these, the six following, or what may be called the laws of sympathetic action, deserve especial attention:

1. Disturbance of action in one part occasions disturbance in others.

In a healthy state of the system, all the organs perform certain actions with a certain degree of vigor, and whenever any one of them has its activity either excited or diminished, more or less change ensues in the action of others, which may thus become disordered in whole or in part. The effect of excited action in causing sympathetic derangement is well known, as in the common case of fever attending inflammation; but the consequences of diminished action are more apt to be overlooked, though not less frequent, or less productive of serious disease. The most extensive and frequent derangement which occurs in

this way proceeds from interruption of the mucous secretion of the intestinal canal. All attentive practitioners have remarked, that when the bowels become costive, various diseases are apt to break out in distant parts of the body. This has been attributed to irritation caused by retention of the fæces, and to the effect of an inflamed state of the lining membrane of the bowels, but it may be more correctly referred to interruption of the usual secretion. Next in order as a source of derangement, from diminution of usual action, ought to be reckoned the skin. The effects of checked perspiration, or mere chilling of the skin, in occasioning general fever and local inflammation, are constantly presented to our attention.

Whenever an accustomed secretion or action of any kind is suppressed, though there may not ensue indications of actual disturbance, there is always a strong disposition to it; and therefore all operations, even of the most trivial kind, ought to be abstained from in such circumstances, as the direct irritation proceeding from them, together with the indirect inducement to derangement already present, might probably occasion violent local and general disorder.

2. A diseased action may, from long continuance, become as it were adopted by the system, so as to occasion disturbance by its suppression.

The fact is well known to the vulgar, who have in consequence the greatest dread of interfering with local complaints of long standing, especially such of them as are attended with discharges. This prejudice is no doubt generally carried too far; but it should be carefully recollected, that excited and disordered action of a part, which has from habit ceased to irritate the system, cannot be suddenly removed without the risk of causing general derangement. Thus, when disease of a bone has occasioned the discharge of matter for a number of years, amputation, especially in adults, is found to be almost certainly fatal.

3. All parts of the body do not sympathize with equal readiness—but seem to be influenced by continuity of texture, contiguity of situation, and participation in the same function. As examples, may be mentioned the connection which is very frequently observed between affections of the mucous membrane at different parts of the body,—the suppuration of the cheek which

is apt to be caused by the irritation of a decayed tooth,—and the fellow-suffering which is displayed by the breast and uterus in the derangements of each other.

4. Excited action of one part may take the place of that in another, the system seeming inadequate to the support of both.

This translation of disease from one part to another is named Metastasis, and constitutes a most important principle of practice, as being the foundation of what is called counter-irritation, or the excitement of artificial disease for the relief of others more inconvenient or dangerous, as in the common case of a blister being applied to the chest to relieve disturbance of the lungs.

5. Pain, hemorrhage, inflammation, increased nutrition, and excited secretion, take the place of each other, so that they may be regarded as equivalents of action. Thus in the disease named *tic douloureux*, an intensely painful affection, which usually proceeds from derangement of the mucous secretions, the most effectual relief is obtained by causing copious discharges from the bowels through the operation of powerful purgatives. The monthly discharges of blood from females cease when the nutrition of the *fœtus in utero* commences—or when a large tumor is formed in any part of the body; it also does not appear while the secretion of milk continues; and when, independently of these conditions, it ceases to appear, local inflammation, as that of the eye, is apt to occur. The local abstraction of blood and the establishment of suppurating surfaces are every day practiced for the counteraction of inflammation. It is unnecessary to mention more examples of such counterbalancing effects; but it must be observed, that the exchange is more ready between some of these morbid states than others, which must be attended to in the use of counter-irritation.

6. General disturbance or fever, however induced, is apt to terminate in some local affection.

Most people have what may be called their weak part, which gives way on such occasions, and in many acts like a safety-valve, by protecting organs of more importance; as when sore throat, herpetic eruptions of the ears, or erysipelas, is apt to result from constitutional disturbance. This proneness to particular local diseases may be either congenital or the result of

habit. In the former case it leads to what is called hereditary disease, of which gout may be mentioned as an example.

Treatment of Inflammation.

The great object in treating inflammation is to make it terminate in Resolution—that is, to subside and disappear without leaving any change in the structure or actions of the part. The most obvious step in the first instance with this view is removal of the cause which excited the disease, should it still continue in operation. When the cause is direct, this can sometimes be accomplished speedily and perfectly, as when a foreign body occasions disturbance by its presence. But when it is of an indirect kind, such as the suppression of some natural secretion or discharge, from the mucous membrane or uterus for instance, the process for removing it is generally more difficult, requiring the careful administration of medicine and strict attention to regimen. When the cause cannot be remedied at once, or when the inflammation continues after its cause has ceased to operate, which is generally the case, the morbid action requires the use of means for its suppression.

The symptoms of inflammation naturally suggest the abstraction of blood,—and this until lately has accordingly always been regarded as its great antidote, though much less often really required than was formerly believed. Blood may be withdrawn *locally*, from the inflamed part or its neighborhood, and *generally*, from the larger veins or smaller arteries. The veins are almost always preferred for this purpose, from being more superficial than the arteries, whence they are more easily opened, and from being more easily closed. Those at the bend of the arm, the external jugular, and more rarely the veins of the hand and foot, are chosen for venesection.

Venesection.—The patient should be placed in a reclining posture, unless the peculiar circumstances of his case should render some other more convenient; a bandage is then to be put twice round the arm, about an inch above where it is proposed to open the vessel, and tied with sufficient force to obstruct the veins without impeding the current of the artery. The surgeon now chooses the largest vein, which is generally the median ba-

silic—puts the limb into such a position as may be preserved while the blood is flowing, and presses the thumb of one hand upon the vessel immediately below where he proposes to puncture it, in order to prevent it from rolling, and the blood from escaping until he is ready to receive it; then holding the lancet with the other hand, he introduces it into the vein obliquely, in respect to the direction of the vessel. When the blood appears, he ceases to push the instrument deeper, but carries it a little further forward, in order to enlarge the opening of the vein; and, lastly, elevates the point, so as to make the external wound of sufficient size. The pressure of the thumb is then removed, and the blood is allowed to flow so long as seems proper. The surgeon, when a sufficient quantity has been abstracted, slackens the bandage—places his thumb upon the orifice—cleanses the arm from blood—lays a small compress of folded lint on the wound—and applies with moderate firmness a single turn of a bandage in the figure of 8.

It frequently happens, from the operator making too small a wound, or the opening of the vein ceasing to correspond with that of the skin, that the blood enters the cellular substance, and constitutes a tumor, which is named *Thrombus*. It produces no inconvenience, further than arresting the flow of blood; and if from this, or any other cause, the quantity desired cannot be obtained, it is better to open another vein, than to run the risk of exciting inflammation in the one already wounded, by introducing probes, or using any other contrivances for assisting the blood to escape. When the patient is fat, or the vessel small, the surgeon, not being able to see the veins, must feel for them; and then the one already mentioned, the median basilic, is generally recognized most easily, both from its large size and regular situation, on the inner side of the tendinous attachment of the biceps to the fascia of the fore-arm. The humeral artery lies under the vein at this point, but runs no danger of being wounded, unless the lancet is used with undue force. The only artery that can be injured in a natural distribution of the vessels is the humeral; but the arteries of the fore-arm frequently take a superficial course, which makes them assume the appearance of veins; whence it is always proper to ascertain, before introducing the lancet, that the vessel is really a vein by its want of pulsation. The cutaneous nerves

are so small and intimately connected with the veins that they cannot be avoided by any precaution; and there is reason to believe, from the acute pain occasionally complained of, that they are not unfrequently divided; but bad consequences seldom if ever result, either from this source or the alleged pricking of tendons, which was formerly much dreaded. When any local inconvenience results from the operation, it is now thought to depend upon inflammation of the skin, cellular substance, or vein, owing to peculiar irritability of the patient's constitution, or the manner in which the surgeon has inflicted or dressed the wound. These accidents will be best avoided by performing the operation as has been described above; and when they do occur, ought to be treated according to the principles which will be explained hereafter, in connection with the textures liable to injury.

The external jugular may be rendered sufficiently tense for being opened, by pressing on it with the thumb a little above the clavicle. The lancet may then be introduced in the same way as has been recommended; and if the incision be made in the direction of the sterno-mastoid muscle, it will not only insure the division of the superjacent fibers of the *platysma myoides*, but also have the proper degree of obliquity in respect to the coats of the vein. The edge of the cup, which is to receive the blood, being held tightly below the aperture, will determine the blood to flow through it; and when a sufficient quantity has been obtained, its further escape will be easily prevented by applying a small compress of lint, which should be retained by two crossing slips of adhesive plaster rather than by a bandage encircling the neck, as this might reinduce the bleeding.

Arteriotomy.—The only artery now ever opened intentionally for the abstraction of blood is the temporal. Either its anterior or middle branch may be selected, but the former is the most convenient; and the best part of its course for the purpose is just where it begins to be covered by the hairs of the head, a few of which ought to be shaved off previously to the operation. The artery is sometimes so large and superficial that it may be opened in the same way as a vein; but, in general, this method would not succeed, as the small size and depth of the vessel render it extremely difficult to avoid either cutting its coats entirely across or pricking them slightly, in both of which cases the blood does

not flow freely. Many plans have been proposed to obviate this difficulty, but the simplest and surest is to place the points of the fore and middle fingers over the artery so as to ascertain and mark its course—then to make an oblique incision about half an inch long with a lancet through the integuments over the vessel where it lies between the fingers—and lastly, to introduce the instrument gently again and again until the blood springs out. The operation may also be rendered more certain by using a small cupping-glass having an oval aperture fitted to the shape of the temporal region; even if the artery should have been completely divided, this means will induce the blood to flow from it. To stop the hemorrhage a firm compress of lint should be placed on the wound, and then a bandage a yard or two long, and an inch broad, rolled up at each of its extremities, being applied first to the opposite side of the head, should be brought round and crossed over the artery, after which its ends are to be carried back again in the opposite direction, and this repeated until sufficient pressure is effected.

Effects of Bleeding.—The first effect noticed is a diminution in the force and rapidity of the circulation, which is manifested by the pulse becoming slower and softer. By-and-by the motion of the heart is so much weakened that it no longer propels the blood with sufficient force to support the functions of the brain. The individual becomes pale—he complains of weakness and nausea, which sometimes proceeds to vomiting, but more frequently, the functions of the brain becoming more and more completely suspended, he loses all power of sensation and voluntary motion—he is no longer able to stand or sit—there are frequently slight tremors of the muscles, and in some rare cases violent convulsive contractions of them—he makes some deep inspirations and expirations—looks wildly about him, and falls into a state closely resembling death, which is named Syncope. Syncope occurs most readily when the patient is in an erect posture, and a very large quantity of blood may be withdrawn without inducing it if he lies horizontally. The most effectual method of recovering one from this state is consequently to lay him down with his head on the same level as his body. The quantity of blood which must be abstracted to induce syncope in ordinary circumstances is extremely variable. Sometimes several pounds

may be withdrawn before its symptoms appear, and at other times a few ounces are sufficient for the purpose; the patient's mental alarm has a considerable share in producing the effect, but in general sixteen or twenty ounces are required.

When the patient is very weak, or very largely depleted, the syncope either passes directly into death, or is succeeded by an intermediate state, named Sinking. In this condition the pulse is small, feeble, and intermittent; the countenance is deadly pale, and bedewed with clammy moisture; the extremities are cold, and the patient has a distressing sensation of weakness. He lies in a dozing state; and when roused from it, takes some time to recollect his situation, often at first expressing himself incoherently. His breathing is uneasy, being performed with dilatation of the nostrils, and is frequently attended with slight crepitation, or mucous rattle in the chest. This state, after continuing for hours, or it may be even for days, terminates in recovery or in death.

When the quantity of blood abstracted is not too great, in proportion to the strength of the patient, there is a recovery or reaction of the system. After an ordinary syncope, the symptoms go off in the inverse order of their approach; and when the patient has completely regained his faculties, it is generally observed that the actions which were suspended are performed with a slight degree of excitement. This is most observable with regard to the pulse, which is rather more sharp and frequent for some time afterward than it was before, provided the patient did not labor under any febrile disturbance.

This excess of reaction is observed to be proportioned in degree to the strength of the patient and the quantity of blood withdrawn, provided it is not so large as at once to induce sinking or death; and, in circumstances favorable for its production, may become so excessive as to simulate closely the symptoms of inflammatory fever. The pulse is extremely frequent, and has a peculiar jarring or jerking sort of character—the respiration is hurried—the face is flushed—the eyes are red and suffused—the patient complains of intense headache and distracting noises in his ears—and when blood is drawn it exhibits the buffy coat, though hardly the cupped surface which is seen during inflammation. The local symptoms of inflammation are not wanting; and the

brain, with its membranes, is the part which most frequently suffers; but the viscera of the thorax and abdomen are not exempt from risk.

This curious state, for pointing out which we are much indebted to Dr. Marshall Hall, may be induced either by one or two very large bleedings, or by a number of small ones, causing a continued drain on the system for days, weeks, or months; and accordingly, as it occurs in one or other of these ways, the symptoms vary in the degree of their violence or acuteness. It may terminate in fatal effusion on the brain, or some other important organ, in sinking, or in a return to health. Bleeding, as might be expected, though it affords temporary relief, is apt to increase the evil, either by making the state of excitement more quickly terminate in sinking, or by increasing the violence of its symptoms. Perfect rest, both of body and mind; cold applications to the head; gentle opiates; and the gradual operation of time, ought to be trusted to as the means of relief.

The discrimination between the symptoms of excessive reaction and those of inflammation is of the utmost importance in practice; and the following observations as to the circumstances which modify the effects of hemorrhage are deserving of much attention.

In young subjects, that is to say, children and infants, the power of reaction is feeble, and the risk of sinking consequently great; but if the immediate danger be surmounted, recovery is accomplished quickly and perfectly.

In adults who are weak from age or any other cause, there is also small power of reaction; but their danger of sinking is not merely in the first instance, and continues for a much longer time afterward, as the restoration to health is slow and imperfect.

In the healthy and robust individual there is always excessive reaction, unless the bleeding be so small as not to affect the system sufficiently, or so profuse as to cause sinking or death in the first instance.

Pain, fear, and the exhaustion produced by protracted fever or the discharge of matter, increase the risk of sinking.

Local Bleeding.—Blood may be abstracted locally by scarifying, leeching, and cupping.

The first method can be employed only when the part inflamed

is superficial, or when the skin and subjacent cellular texture are affected. In which cases incisions are often useful, not only by allowing blood to escape, but by relieving tension.

Leeches should be dried before they are used, and the part to which they are applied ought to be carefully washed with warm water. When they are wished to fasten at a particular point, they should be inclosed in a small cone of paper or linen, which allows merely the head to project. After they fall off, the bleeding is to be encouraged by fomentations or a poultice, unless it proves excessive, as sometimes happens, particularly in children, when a small piece of lint ought to be pressed firmly on the wound. If this means should fail, which it seldom does, the nitrate of silver may be applied, or the wound may be transfixed by a small needle or pin, and tied with a thread. The quantity of blood obtained by cupping depends greatly on the part which is chosen for the purpose. The skin should be well fomented before the operation, and carefully protected from the influence of cold during its performance. The glasses should have wide mouths, and be frequently emptied, to prevent the blood from coagulating over the wounds, which opposes its flow, unless they be made of such a shape as to prevent this. The most convenient form, especially to an operator not practiced in the management of ordinary cup-shaped vessels, which require to be frequently emptied and reapplied, is that of a distended leech—the glass being about six inches long, and two inches wide at the mouth. In using this apparatus a piece of paper moistened with spirits is introduced into it and kindled—the mouth is then applied over the wounds which have been made by the scarificator,—and, the bulging part of the vessel being placed in a dependent position, the blood continues to flow into it, without coagulating upon the orifices, until a sufficient quantity is obtained.

Purgatives.—These are substances that, when introduced into the intestinal canal, produce more or less irritation: the effect of which is a greater secretion from the mucous membrane, and increased contraction of the muscular fibers. In consequence of this double operation, the dejections are more frequent and copious than usual; and the patient is not only relieved in the way of metastasis, that is, from having an action excited at a distance from the diseased one, but also has those secretions re-

stored the suppression of which is frequently the indirect cause of inflammation.

Many different purgatives are employed in medicine; but the most useful in subduing inflammation are calomel, colocynth, jalap, rhubarb, croton oil, and sulphate of magnesia. The saline purgatives induce a very copious secretion from the whole surface of the intestines, while calomel is thought to act more particularly on the liver, by restoring or promoting its secretion. The blue pill and rhubarb are very beneficial in gradually restoring these actions to a state of health when their disturbance has occasioned chronic inflammation.

Purgative agents are often introduced into the rectum with the view of hastening the effect of those administered by the mouth, or superseding the necessity of their use, when from any circumstance their employment happens to be inconvenient. The grand essential of these injections, clysters, or enemata, as they are named, is quantity sufficient to distend the rectum, since this is the proper stimulus of that gut. From one to two pounds of gruel, or simply tepid water, should be used, and made more or less irritating, according to circumstances, by the addition of common salt, olive oil, castor oil, sulphate of magnesia, or oil of turpentine, etc. Various apparatus used to be employed for the purpose of injection; but the simple and efficient means of Read's syringe, and Higginson's tube, have superseded all the others.

Diaphoretics.—These are remedies which, in the effect they produce, bear the same relation to the skin that purgatives do to the mucous membrane of the intestines. They increase the action of the skin, and are thus beneficial either in the way of metastasis or in removing the cause of the inflammation, by restoring a secretion which has been suppressed.

The salts of ammonia have a diaphoretic effect; but, being of a stimulating nature, are questionable remedies for subduing excited action of the system. The *Aqua Acetatis Ammoniæ*, however, may be given with much advantage in small doses, from time to time, after the force of the disease has been broken by other means. Ipecacuan is less objectionable in this respect, and the combination of it with opium, constituting Dover's powder, is often extremely useful. By far the best diaphoretic, however, for subduing inflammatory action, is the tartrate of antimony,

given in small and frequently repeated doses, so as to maintain a slight nausea, or even occasional vomiting. The warm bath is a powerful diaphoretic, and would often be very advantageous if it could be procured; but the difficulties which usually attend its employment in private practice are so great as almost to proscribe it. The vapor-bath is more readily administered, and may perhaps come into general use. All the apparatus required is a piece of lead or tin tube three or four feet in length, a tea kettle, and a blanket. The patient sits on a stool near the fire and covered with a blanket. The tube is attached to the spout of the kettle by one extremity, and has the other placed under the stool. The heat may be ascertained by a thermometer, and regulated by the degree of ebullition. Much benefit is frequently derived from the semi-cupium or hip-bath, and the pediluvium or foot-bath; and still more local baths are of great service in the form of Fomentations and Poultices. Fomentation is generally effected by applying a piece of flannel or a sponge wrung out of hot water, and changing this from time to time as it cools, for the space of fifteen or twenty minutes. A flannel bag containing chamomile flowers, and allowed to cool sufficiently after being boiled a short while, is preferred by many for the purpose; and a decoction of poppy heads also is occasionally employed. Poultices may be prepared from any substance which, together with warm water or milk, constitutes a soft pulpy mass, capable of retaining the heat and moisture. Bread, barley-meal, and linseed-meal are chiefly used; but carrots, turnips, and leaves such as those of spinach and hemlock, are thought preferable in certain cases. These articles are either inclosed in a thin linen or muslin bag, or placed directly on the part concerned, in which case it is necessary to spread some butter or other oily substance on the poultice, to prevent it from adhering inconveniently to the surface of the body. Instead of poultices, some folds of lint, moistened with hot water, may be applied, and covered with a piece of oiled silk. Heat is sometimes applied locally without moisture, as by means of a bag containing heated salt, but is then found to be not so efficacious.

Narcotics.—These are medicines which, without causing any real diminution in the power of the system, produce a temporary indisposition for action. Of these the most useful are opium, tobacco, hyoscyamus, and belladonna.

ASTRINGENTS.—These are remedies somewhat similar in effect to those last mentioned. Cold, acetate of lead, and nitrate of silver are the best means of this kind. Cold is more efficient in preventing than curing inflammation. It is of no use unless it can be applied either to the part affected or in its immediate neighborhood; and then only when the diseased action proceeds from direct irritation. The acetate of lead is used externally in solution, either alone or along with opium, in the proportion of three or four grains of each to the ounce. It is generally applied warm, and has great effect in allaying inflammation depending on undue irritability.

PRESSURE.—When the part or system is disposed to overact by the weakness of its power, especially when it is attended with œdematous swelling, pressure may often be exercised advantageously by bandaging.

COUNTER-IRRITANTS.—The means of removing inflammation which are included under this title act on the principle of metastasis, and excite irritation of various degrees as to intensity and duration. The most gentle in their effect are named rubefacients, of which may be mentioned mustard, oil of turpentine, ammonia, gum ammoniac, camphor, and some of the mineral acids. Blisters or vesicatories are applications which, as the name implies, occasion blisters of the skin or elevations of the cuticle, by fluid diffused under it in consequence of their irritation. The plaster of cantharides is most frequently employed for this purpose; but, when the effect is wished to be strong and immediate, recourse may be had to boiling water, or the concentrated mineral acids. The nitrate of silver is occasionally preferred for the purpose, being rubbed on the part after it has been moistened with water.

So soon as the blisters caused in either of these ways have risen, they ought to be cut, so as to allow the serous fluid they contain to escape, after which the surface is to be dressed with some simple ointment. In order to prolong the irritation of blisters, it used to be customary to dress the raw part with an ointment containing savine leaves, or the powder of cantharides, which prevented it from healing, and maintained a discharge of matter. When continued irritation is required, it is now more frequently effected by the tartrate of antimony, which, when applied to the skin either in solution or ointment, occasions a

pustular eruption, that may be regulated as to extent and duration by the same means.

Another mode of causing permanent counter-irritation is to institute a discharge of matter from a breach in the continuity of the skin. The introduction of a seton used to be, and still is, with many people a favorite way of effecting this. The operation is most easily done with a seton-needle,—an instrument shaped like a lancet, about three inches long, three-eighths of an inch broad, slightly curved, and having an eye at the blunt end. A fold of skin being held up, the needle is pushed through, and by its means a thread, to which a skein of silk or cotton sufficient to fill the aperture can then be introduced. In absence of the needle, a straight sharp-pointed bistoury and probe will be found to answer nearly as well. In a few days, when the discharge of matter commences, a new seton may be passed by drawing it through the loop of the old one—and this may then be repeated daily. Issues are now more frequently employed with this view. They are merely breaches in the surface caused by the knife, caustic, or the actual cautery; that is, red-hot iron. When the knife is used, it should be pushed through a fold of the skin, and then some foreign bodies must be placed in the wound to prevent it from healing. The caustic potass is generally employed for opening issues. It may either be applied for three or four hours made into a paste with soap or bread, and limited in its operation by a defense of adhesive plaster having an aperture cut in it of the requisite size, or simply rubbed in substance upon the skin until the alteration of color and consistence indicates that its effect is sufficient. In either case, after the action of the caustic is completed, a poultice ought to be applied until the portion of skin that has been destroyed separates, when some foreign substances, such as those already mentioned, must be introduced to prevent the opening from closing. The actual cautery is the best method of the whole, since the breach which it occasions requires no means for keeping it open, and does not heal until after many weeks or months, or healing applications are employed. The pain is severe but almost momentary, and, on the whole, much less than that of the caustic; while the counter-irritating effect is found to be greater than that of any of the other means.

Counter-irritation may be effected also by moxa. This consists in burning small cones of the down of the Artemisia, or what answers equally well, provided the combustion be maintained by a blow-pipe or bellows, raw cotton made into cylinders from one to two inches wide and three-quarters of an inch thick. Every degree of irritation may be thus produced, from the slightest reddening to the most complete burning; but it is difficult to regulate the effect, and there seems to be no advantage in attempting to do so, as the other means which have been mentioned are more under command, and at least equally efficacious.

Acupuncture.—This remedy for inflammation must stand by itself. It consists in the introduction of slender needles from one to three inches in length into the inflamed part by a gentle rotatory motion. No respect is paid in doing this to the importance of the organs, and the heart, stomach, arteries, and nerves have all, it is said, been transfixed without any ceremony, though fatal consequences are reported to have sometimes resulted from this rash practice. No pain or other symptoms of irritation are in general produced, and, on the contrary, a diminution of the inflammatory indications is alleged to be frequently observed. This practice is of ancient origin, and held in much esteem in Eastern countries, where, as in China and Japan, its employment is said to constitute a distinct department of the surgical profession. Some years ago it was tried pretty extensively in France, and also in this country, but it now seems to be going, or rather to have already gone, into disrepute, except in the treatment of Sciatica, where it is of the greatest service. It would seem that the effect of acupuncturation is proportioned, not to the number of the needles, but to the depth they are introduced, and the time they are allowed to remain. I generally use only one at each seat of pain, and leave it for two hours.

Choice and Combination of the Means which have been mentioned in treating Inflammation.

General bleeding is of no use as a preventive of inflammation, unless it removes some derangement of the system, or counteracts its tendency to excite inflammation. It has most effect at the

commencement of inflammation, and is most beneficial when there is great power of action. It is better to take a large quantity of blood at first, so as to produce some decided effect, than to bleed frequently by small portions. When it is found necessary to take away a large quantity of blood, an opiate given immediately afterward is useful, by diminishing the tendency to reaction; and a small bleeding of a few ounces is often serviceable, with the same view, if practiced soon after the first one, just when the symptoms of returning action appear.

After the force of the disease has been broken by bleeding, if necessary, purgatives and diaphoretics are proper. It is usual to premise the mercurial, and follow them up with the saline ones. The tartrate of antimony is the best diaphoretic, and, by powerfully diminishing the tendency to violent action, in a great measure supersedes the necessity of bleeding, except at the commencement of the attack. Local bleeding is of most service, in treating acute inflammation, as an adjunct to the measures of a general kind. Blistering is most useful in chronic inflammation, and ought never to be employed in other cases until by bleeding, or some other means, the power of action has been lessened. All the other modes of counter-irritating are most advantageous in, or rather entirely restricted to, chronic inflammation.

Opiates and astringents are most beneficial, both externally and internally, when there is much irritability, or tendency to act more than in proportion to the strength of the part or system.

Resolution.—When the symptoms of inflammation subside, they do not leave the part affected altogether in its natural state. It generally remains for a time somewhat swelled, tender, and unfit for the performance of its duty, whence it requires rest, mechanical support, and gentle stimulation.

CHAPTER II.

MORTIFICATION.

Symptoms of Mortification.

When inflammation, instead of terminating in a return to the natural action, goes on to the destruction of the part concerned, it is said to terminate in Mortification. In this case, the part is not only deprived of sensation and voluntary motion, but is completely divested of all vital properties, so that no opposition being any longer presented to the exercise of chemical attraction, putrefactive decomposition at once commences. The appearance of a mortified part varies with its texture, just as happens in putrefaction. The soft juicy tissues suffer most alteration, and the hard fibrous ones least. The former are reduced at once to the state of a fetid pulp, or hard leathery consistence, while the latter retain their distinctive characters for a much longer time. Another circumstance that affects the appearance of a mortified part, is the degree of action which has preceded its death, since the softness and fetor will of course be greater if much fluid has been accumulated previously. This has led to the old-fashioned division of mortification into *moist* and *dry*. These terms have also been employed, with less propriety, to express the difference which depends upon the disease being of internal or external origin; in other words, spontaneous, or the result of injury.

The symptoms of mortification may be divided into those which precede its accomplishment, those exhibited by the mortified part, and those of the system which attend the local changes.

The symptoms that precede acute mortification are, generally speaking, those indicative of intense inflammation. The redness is bright and fiery, the pain hot and burning, and the swelling

tense. As mortification approaches, the swelling becomes less tense, and pits on pressure. The skin acquires a yellowish hue, and exhibits dark mottled spots or broad lines over its surface. The temperature of the part becomes lower; and vesicles, containing a thin serous fluid of a yellow, green, or purple color, which are named *phlyctenæ*, make their appearance. This state is called Gangrene, or gangrenous inflammation. The part is not dead, but only threatening to die, and may still admit of recovery, though a portion of it at least usually does perish. When the vital power is completely extinguished, the part ceases to be painful or sensible, shrinks in proportion to its previous distention, becomes black, brown, ash-gray, or buff-colored, and emits a peculiar characteristic fetor, which is nearly the same whatever be the tissue concerned. It is then said to be sphacelated, or to constitute a slough.

The symptoms presented by the system, while these local changes are taking place, deserve great attention. They are nearly those which have been already described as attending sinking from excessive hemorrhage. The countenance is pale, cold, and moist; the features seem small and contracted; and the appearance exhibits that ill-omened aspect which has been designated the *facies Hippocratica;* the pulse is quick, feeble, and irregular; the tongue is brown; and the lips frequently display small dark-colored scabs. The patient lies on his back completely collapsed, or, as it were, sunk down into his bed; he has frequent coffee-colored vomiting, and suffers from almost incessant hiccough. His body emits a peculiar odor, somewhat like that of moist earth. He sometimes retains his mental faculties entire; but more frequently falls into a dozing state, alternated with low muttering delirium. The breathing becomes obstructed by mucous effusion, and death closes the scene.

It is not easy to account for these constitutional symptoms. They have been attributed to the sphacelated part acting like a poison. But where sloughing is induced directly by chemical or mechanical means, even to a great extent, it is not usually attended with the effects in question. They have been also referred to the general exhaustion of power which the system suffers from the intense overaction that precedes the mortification. But this opinion is irreconcilable with the fact that removal of

the sphacelated part alleviates, and sometimes completely arrests, the constitutional symptoms. They have, therefore, as the only other explanation, been accounted for by supposing that the gangrenous or dying action extends itself over the system. Whatever be the true reason of the constitutional effect, there can be no doubt that it bears a direct proportion to the importance of the part affected, and the violence of the action which precedes the destruction of its vitality.

In chronic or dry gangrene, the local changes are of a similar kind, but slower progress, and less striking character. The constitutional symptoms, also, are milder in a proportionate degree; and, indeed, not unfrequently altogether absent.

Causes of Mortification.

The causes of mortification, or circumstances which induce inflammation to terminate in it, may be referred to weakness, or defective powers of action; excessive irritability, or disposition to act; and excessive irritation, or excitement to act.

Weakness.—The different tissues possess different powers of action. The tendons and shafts of the bones are very apt to die when inflamed—the cellular substance is less so—the skin still less—and the coats of the arteries least of all. The weakness which predisposes to mortification may also depend on general debility of the system. In the advanced stage of fevers, the slightest irritations are apt to occasion sloughing. In weakly children, exhausted still further by disease, this effect is of course more certainly produced; whence blisters are dangerous applications in such circumstances. Bad or defective food, and especially the use of unsound rye, when subject to the morbid condition named Ergot, may cause such an unhealthy state of the system that the slightest local irritation, or even inflammation occurring spontaneously, leads to extensive sloughing of the extremities.

A part merely of the body may be rendered weaker than usual, so as to be more prone to mortification, and this in various ways. When the principal artery of a limb is tied, there is no longer sufficient strength for carrying on the usual actions—the weakened part seems to make an effort to recover—heat, pain,

swelling, with the other symptoms of inflammation, supervene, and, if they are the least excited by external circumstances, soon wear out the diminished power that remains. The arteries occasionally become obstructed spontaneously, and this probably gives rise to the mortification of the toes which not unfrequently happens in old people.

The GANGRENA SENILIS, as it has been named, was so well described by Mr. Pott, that his name is generally connected with it. The disease is seldom met with before the age of sixty. It occurs more frequently in males than females; and chiefly affects persons addicted to the pleasures of the table. It is usually preceded by uneasy feelings, sometimes amounting to intense pain, in the foot, which, at the same time, is observed to be more or less swelled. A brown or purple spot then shows itself—most frequently in the neighborhood of one of the nails, but it may be in the sole or on the instep; the surrounding skin becomes red, hot, and distended; the cuticle separates from the discolored spot, and exposes the subjacent texture in the state of slough. The morbid process then either gradually advances until the patient sinks under it at the end of weeks or months, or gradually relaxes in severity, and, ceasing to extend, permits a cure to be accomplished in the way hereafter to be explained. It has generally been supposed that the cause of this disorder consists in a weakened condition of the foot, probably depending upon obstruction of its arteries, or ossification of their coats.

Nearly the same effect is produced when the blood is prevented from returning through the veins by pressure or closure of them from other causes. The obstruction of one vein, even though the principal one of the limb, may not produce troublesome consequences, occasioning mortification, but if the principal artery be at the same time obstructed, death of the part is certainly induced.

Defect of nervous energy also predisposes to mortification. People who are paralytic in the inferior extremities, are apt to have sloughing induced by slight bruises. When the principal nerve of a limb is cut or otherwise interrupted, a tendency to mortification is frequently observed at the extremity.

IRRITABILITY OR EXCESSIVE DISPOSITION TO ACT.—Weak parts are always irritable; and hence this cause of mortification

is to a certain extent comprehended in the former one. But, independently of weakness, and in the most opposite state of part or constitution, there is frequently an excessive disposition to over-action. People who exceed in eating or drinking, or who do not take exercise in proportion to their food, are liable to this morbid disposition, which is also sometimes met with as an original peculiarity of constitution.

Excessive irritation or excitement to act.—Generally speaking, while other things are equal, the violence of inflammation is directly in proportion to the irritation. Whence it follows, that severe injuries, or other great and continued irritations, are apt to occasion mortification. Thus there is no constitution able to resist mortification from the shattering of a limb, or the infiltration of urine into the cellular substance.

Treatment of Mortification.

The prevention of mortification requires the use of means proper for obviating the predisposing causes. If there is general weakness of the system from the use of improper food, or any other cause, it must be remedied by a more wholesome regimen, and, if necessary, supported in the mean time by the administration of wine, spirits, and other stimuli of speedy operation. If any cause of local weakness exist in operation, it ought, if possible, to be removed; and the part which is weakened should be protected from all excitement. If the principal artery of a limb, for instance, has been tied, or if the part has been weakened by exposure to intense cold, every sort of local stimulating application should be carefully avoided, while the system is at the same time protected from excitement. In the treatment of *gangrena senilis*, it was customary to prescribe large quantities of wine and spirits, with a corresponding allowance of animal jellies and other nutritious articles of diet, and to employ, under the title of hot or invigorating dressings, various articles of a stimulating nature. Under this treatment, the evil progresses; and even the opium that is often used, in compliance with Mr. Pott's advice, fails either to afford relief from the pain, or to check the advance of the disease. It would appear, that, in this as on other occasions of deficient strength, depending upon local causes, while the

power to act is lessened, the tendency to excitement is increased; and that, as cordials and stimulants cannot supply the vigor which is wanting, they merely increase the morbid disposition to inflammation. I have therefore advised, on theoretical as well as on practical grounds, that the diet of patients laboring under this disease should be strictly of milk and farinaceous food; that they should be confined to the horizontal posture; and that the part affected should be enveloped in a thin linseed-meal poultice of gentle temperature. The only addition to these means required, until the slough separates, is the use of muriate of morphia, in doses proportioned to the patient's sufferings.

If, instead of weakness, the irritability depends on strong power of action, it ought to be lessened by bleeding, purging, tartrate of antimony, and tobacco injections. When the mortification is completed, the slough should be cut away so far as is practicable, without encroaching on the living parts, in order to diminish the fetor; yeast poultices are sometimes used with this view, but they generally occasion uneasiness. The chloride of lime or soda in solution, diluted nitrous acid, or the *unguentum resinosum*, with an equal quantity of oil of turpentine, are less objectionable applications; but nothing answers so well as a poultice of some soft soothing substance, such as linseed-meal.

The extreme prostration of strength that accompanies the acute form of mortification, peremptorily demands diligent support from wine and spirits. When the mortification does not cease to extend, it comes to be a question whether or no the surgeon ought to interfere with the knife. The objection to doing so is, that, although the constitutional symptoms may be alleviated for a time after the amputation, the patient is in general soon reduced to the same state by sloughing of the cut surface. The most prudent course seems to be a middle one—to abstain from amputation when the mortification depends upon an internal cause, or one that cannot be removed, and to operate when the cause is external or within reach. It does not follow from this rule, however, that amputation should always be performed when mortification of a limb ensues from external irritation, since the most trivial injury is sufficient to induce it in an unhealthy subject. It is only when the violence of the action is fairly referrible to the local cause, without supposing constitutional defect, that the operation can be

practiced with propriety. Though the extent of mortification may not be defined, if it depends upon a cause which is limited in its operation, as a bruise, or the obstruction of an artery at some ascertained part of its course, the propriety of amputation will be still more manifest.

In those cases where the mortification spontaneously ceases to extend, as when it has resulted from the exposure of a part to cold, it often becomes a question whether the process should be confided entirely to the power of the system, or be anticipated by amputation, in order to hasten recovery, and provide a better stump than could be expected if the bones were allowed to separate without any covering being provided for them. On the whole, it seems best to adopt a middle course, and avoid interference until the soft parts are nearly detached, when they may be easily dissected a little upward so as to expose the bone and allow it to be divided with a saw, or disarticulated sufficiently high to let the integuments meet over, and afford the necessary protection to its extremity.

The discrimination between those cases of external injury in which the mortification is to remain local, and those in which it is to extend, requires no less experience than judgment; and it appears not improbable that some, at least, of the cases in which amputation has been reported as successful, on account of spreading gangrene, were not really of the formidable nature supposed. For although the inflammation induced by a local injury may be extensively diffused over the limb, the mortification is frequently limited to the part directly concerned—as where the leg has been bruised by the wheel of a wagon—so that if amputation be performed in the early stage of such a case, it may have the appearance of limiting the gangrenous process, which, if left to itself, would probably not have extended any further. But there can be no doubt that, upon some occasions, the destructive action, when really spreading, has been prevented from pursuing its fatal course by timely amputation.

CHAPTER III.

EFFUSION.

Effusion of Serum.

THE action or process which is denoted by the expression Effusion, consists in the separation of the serous, or fibrinous portion of the blood, and its discharge into some part of the body.

Effusion is not necessarily preceded by inflammation, but is very frequently a consequence of it. It has already been remarked, that a slight degree of effusion almost always attends inflammation.

Serous effusion takes place chiefly into the interstices of the subcutaneous cellular texture, and into the cavities which are lined with serous membranes, as the *pleura*, or *peritoneum*, and the joints. In the former situation, it occasions a swelling of the part affected, which, unless inflammation exists, is colorless, and pits on pressure. This is Œdema or Anasarca. It occupies chiefly those parts which are most dependent, especially the inferior extremities and the scrotum, and changes its place with the position of the body. In the serous sacs it constitutes collections of fluid, which are named Dropsies.

The fluid, both of œdema and dropsy, generally bears a close resemblance to, or rather seems identical with, the serum of the blood. Sometimes it is more limpid and colorless, tinged with blood or bile, more watery, or loaded with a larger proportion of albumen.

Serous effusion is induced in the cellular texture and serous sacs by various circumstances. It is often observed distinctly as a consequence of inflammation, but in this case the serous sacs are chiefly concerned. It very frequently results from the venous circulation being impeded either by the mere posture of the body, or obstruction of the vessels, or from disease of the heart or liver,

or the presence of a tumor compressing the veins, of which pregnancy frequently affords an example in causing œdema of the limbs. It also by no means rarely occurs without either any previous excitement of the part, or obstruction of the venous circulation that can be observed, and seems to depend on weakness alone. This may happen in both situations, but most frequently occurs in the subcutaneous cellular texture of the inferior extremities, as may be seen in the course of most chronic diseases which terminate fatally.

The means of preventing serous effusion is, of course, to obviate so far as possible the circumstances which occasion it. Inflammation should be treated on the principles which have been explained to make it terminate in resolution. If the circulation of the veins is not free, the impeding cause ought to be removed. If weakness threatens to occasion the effusion, it must be counteracted by means suited to the case, and especially by the use of bandaging, together with the horizontal posture.

The cure of effusion is sometimes accomplished by simply puncturing the skin, or sac containing the fluid, and allowing it to flow out. But very generally, the vessels from which the effusion has proceeded continue their action, so as to renew and maintain it after such evacuation. It is therefore necessary to change the action of the vessels, and this is done by various means. Mere external pressure sometimes suffices, and is more powerful when preceded by the application of blisters, or stimulating ointments and lotions, to the neighboring skin. When signs of excited action continue along with the effusion, general and local bleeding may be proper, together with applications of a soothing nature; and on the principle of counter-irritation or metastasis, diuretics, diaphoretics, and purgatives are administered. It is generally observed, that the effused fluid is more readily absorbed when it is seated in the cellular substance, than when it occupies a serous bag, provided the exciting cause has been removed. When the dropsical effusion is of small extent and superficially situated, particular operations are occasionally performed for its radical cure, as will be explained hereafter under the titles of Bursæ Mucosæ, and Hydrocele.

Effusion of Fibrine.

When fibrine is effused, it presents the appearance of the buffy coat, and is named Coagulable Lymph. This effusion happens most frequently in the same situations as that of the serous kind, but also occurs on the mucous surfaces and in the interstices of tissues.

When the lymph is thrown out upon a surface, it takes the form of a crust or membrane,—and if not disturbed, is apt to become organized and vascular, so as to constitute a permanent structure. Adhesions are thus often effected between adjacent surfaces, as those of the pleura. When lymph is effused on a serous surface, there is generally more or less serum also, which in this case is not limpid and colorless, but turbid, with flakes of lymph floating in it. If the patient survives so as to afford sufficient time for the purpose, the lymph, where adherent to the sides of the cavity, is organized into dense membranous structures, and the serum acquires the usual appearance of a dropsical fluid. The loose portions of lymph sometimes become indurated into masses of a tough consistence and yellow color, which usually resemble each other in size and form, as may be seen not unfrequently in bursæ that have suffered from inflammation.

Effusion of lymph on a natural surface occurs almost always as a consequence of inflammation. It is also occasionally produced by two surfaces of the same kind being pressed together, as may be seen in the blood-vessels, particularly the veins, or in the contents of a large hernia for which an imperfectly fitting truss has been worn. The means of prevention consist in subduing the inflammation that precedes; and it may further be stated, that the constitutional disturbance produced by mercury seems much opposed to the action which occasions the effusion, whence the use of that medicine in cases where injurious effects are threatened from this source, as in Iritis.

Lymph, like serum, is effused into the cellular interstices also, but in this case is not confined to the subcutaneous texture, and occurs with equal readiness in the constituent as in the connecting cellular substance of organs. If time be afforded, it becomes

organized, so as to cause thickening and hardening of the part concerned.

This effusion may occur as a consequence of inflammation, but much more frequently takes its rise from the immediate effect of local irritation, such as that produced by the passage of fluids through preternatural channels, or by the lodgment of foreign matters within the substance of the body, as when the urine escapes by a *fistula in perinæo*, or a bullet lies where it cannot be extracted. The result in these cases is thickening of the surrounding parts, or the formation of a capsule. This process is generally rather beneficial than injurious, as it limits the influence of the irritation, and prevents it from exciting a more violent or injurious action. Its effects generally disappear so soon as the cause that led to them is removed; if they do not, the same means which promote the dispersion of œdema are required —namely, pressure, with blistering, and stimulating ointments.

Lymph is also effused on the surfaces of wounds, and sometimes unites them, so as to remedy at once the solution of continuity. This process is named Union by the first Intention. The steps by which it is accomplished, and the circumstances that oppose and favor its completion, are extremely important.

Every wound is attended with more or less bleeding; and as it gradually ceases, an exudation of serum takes place, which is readily recognized by the faint-colored stain it makes on the dressings. From eight to twelve hours after the wound is inflicted, less or more according to its extent, this discharge ceases, when lymph is effused from the cut surfaces, and if they are in contact, or nearly so, glues them together—becoming gradually organized, and completing the union from forty-eight to seventy-two hours after the injury has been sustained. The union, though now perfect, so far as regards appearance and feeling, does not possess much mechanical strength; and if the lips of the wound be torn asunder, they are found to have a coating of coagulable lymph on each of the respective surfaces, precisely similar to that which is effused upon serous membranes as a consequence of inflammation. Inflammation, therefore, used to be considered essential to this mode of union, which was said to be effected by Adhesive Inflammation. It is now ascertained that inflammation, so far from being essential to the process, is subversive of

it. A certain degree of excitement is not incompatible; but whenever it goes so far as to occasion pain, or much swelling and redness, union by the first intention is frustrated; and the way is led to another process of reparation hereafter to be described, viz., Granulation.

Inflammation being thus preventive of primary union, and the interposition of any foreign substance, or the separation of the cut surfaces, beyond the extent to which they can be glued together by the thin layer of lymph effused from each, being of course no less adverse to the process, it follows that the plan which used to be followed in dressing wounds should be regarded as equally injudicious and injurious. It consisted in closing them immediately, or soon after their infliction, and retaining their lips in accurate contact by adhesive plasters, or other means, pledgets of ointment and bandages being applied—and no change made in the dressing till the fourth day. The consequences were that the blood and serum being confined, the edges of the wound were separated from each other; and the stimulus of necessity, as John Hunter called it, or irritation produced by the continuance of a breach in the structure of the body, which, if primary union had occurred, would have ceased to exist, caused inflammation as the first step to the other mode of reparation already mentioned. Two insuperable obstacles, either of which would have been sufficient for the purpose, were thus placed in the way of direct adhesion—viz., separation of the raw surfaces, and inflammatory action; and when the wound was at length undressed, instead of being united, it was found distended into a cavity filled with matter.

It is much more consonant with reason, and will be found much more successful in practice, to close the lips of the wound only partially, or not at all, for ten or twelve hours, until the bloody and serous oozing shall have ceased, and then to place them in the most exact possible contact, at the same time taking care to prevent or allay excited action by cold applications and suitable regimen. If the wound is so situated that its edges can be kept in contact merely by the firm application of dry lint, which does not oppose the sanguineous or serous discharge, it may at once be dressed in this way without any inconvenience, and with the advantage of saving future trouble. In the year 1825, I pub-

lished an essay in the *Edinburgh Medical and Surgical Journal*, recommending this mode of treating wounds, and I am happy to observe that it has gradually come into use, even with those who at first most strenuously opposed it.

CHAPTER IV.

ABSORPTION.

By Absorption is understood an excess in the action of removal over that of deposition by the nutrient vessels. The effect of this is necessarily a diminution in the bulk of the part concerned, which may be either of the surface or the substance. Absorption, therefore, is distinguished into superficial or ulcerative, and interstitial.

It may occur in both situations as a consequence of inflammation merely, without reference to the exciting cause; but much more frequently depends upon some peculiarity of local irritation, which either occasions it directly, or indirectly through the intervention of inflammation.

The most common exciting causes of absorption are pressure, and the presence of something not naturally existing in the body. It frequently removes fluids effused into the interstices and cavities, and when inadequate to effect this, generally opens a passage for their escape externally, by removing the parietes containing them to such extent as is necessary for effecting an aperture. Foreign bodies which excite more irritation than what is sufficient for causing the effusion and organization of lymph around them, very frequently obtain their discharge by a similar process of interstitial absorption. It is important to notice that, though the pressure or irritation excited by the foreign matter, one would suppose, must be equal on all sides,—the absorbing action always takes place in the direction of the nearest external surface, unless an internal one lined with mucous membrane

should be very near, when the process proceeds toward it. It is by ulcerative absorption of the surrounding living tissues that sloughs are detached.

The means which may be employed for inducing absorption are pressure, stimulating lotions, such as those containing vinegar, spirits, and muriate of ammonia, blistering ointments, and liniments containing mercury and iodine,—also the internal use of the two last-mentioned medicines in various forms.

CHAPTER V.

GRANULATION.

Effects of the Granulating Action.

THE term Granulation is applied to an action which repairs breaches in the continuity of the surface that are not healed by primary union. Such breaches may be caused either by violence or absorption, and in both cases are named Ulcers. An ulcer may be defined to be a solution of continuity in a natural surface, secreting matter.

When a wound does not heal by the first intention, it begins about twenty-four hours after the injury has been sustained to be painful, and attended with the other symptoms of inflammation. A thin serous discharge oozes out from it, and by-and-by the surface acquires a uniform appearance, whatever be the tissues which compose it, owing to an effusion of lymph that seals up the interstices of the cellular substance, and forms a thin superficial covering. About the third day, sooner or later, according to the activity of action, the incrustation of lymph becomes organized,—it acquires a red color, bleeds when touched, and before many days have elapsed shoots up into small granular projections, whence the process is named. These granulations are small, pointed, firm, and vascular,—they are covered with a fine pellicle, and secrete a peculiar straw-colored fluid named Pus,

the properties of which will be more particularly described hereafter.

The wound is now, properly speaking, an ulcer, and the subsequent process of healing is the same as in ulcers caused by absorption. The inequality of surface, if any existed, gradually disappears, the bottom of the ulcer becomes regularly concave, and at length there ceases to be any difference of level between it and the surrounding parts. While these changes are taking place, the extent of the breach is daily diminishing, by a general contraction of the surface. Then a fine blue pellicle is observed at the edge, which increases in breadth, and at last covers the small remnant of the ulcer that is not closed by the contraction just mentioned. This new-formed skin is named the Cicatrix; which is, of course, smaller in extent than the original breach of continuity. At first it is blue or purple, and very vascular, but afterwards it ceases to be so, and becomes dense, white, and bloodless, at the same time contracting still further.

Nature of the Granulating Action.

It is generally believed that the granulations grow up above each other, by the effusion and organization of lymph in successive layers, until the cavity is filled to the proper level. That then the thin pellicle on the surface begins to be thickened and formed into skin at the circumference of the ulcer, while the granulations below shrink, owing to absorption of their constituent substance, and draw the edges of the breach together. There can be no doubt, however, that this opinion rests on inaccurate observation, and is quite incorrect. The subject was carefully investigated by the French Academy of Surgery; and the essays of Louis, Fabre, Pibrac, etc. leave hardly anything to be desired for its elucidation. They showed that there is never any real reproduction of lost parts, with the exception of bone, which in some circumstances is regenerated. The skin also ought, perhaps, to be excepted; but the difference as to appearance and properties between the substance that constitutes a cicatrix, and the ordinary integument of the body, would rather lead us to regard this structure as a new formation. In all other cases it will be invariably found, that when the cure is completed there

either remains a depression corresponding to the loss of substance, or such a contraction of the neighboring parts as compensates for the want.

The first step in the healing of an ulcer seems to be subsidence of the surrounding swelling, if any exists; and then a gradual emaciation, chiefly of the fatty, but also of the other tissues concerned, so as to render the skin more lax and easily drawn together. Hence it is that the cicatrix when first formed appears to be on a level with the neighboring surface, though there may have been a loss of substance to a considerable depth. After the cure is completed, the usual plumpness returns, and the cicatrix will then be found depressed. Ulcers being thus healed by contraction, and not by any new production except what forms the cicatrix, the reason appears why their cure is accomplished more readily in parts that are lax than in those which are comparatively fixed from adhering to the subjacent bones. The sore which remains after the removal of nearly the whole scrotum by sloughing or operation readily heals, with a very small cicatrix; while injuries of the scalp attended with loss of substance are repaired very slowly, and with a considerable depression at the part. The old stories of regeneration following removal of the lip for cancer, and destruction of the *glans penis* by sloughing, when inquired into and stripped of their exaggerations, are found to admit of easy explanation. In the former case, it is apt to appear that the disease occupies a larger extent of the part affected than it really does, from the morbid growth taking the place of and pressing aside the sound textures. Hence the whole lip may seem to be involved and taken away by operation, while, in fact, a comparatively small portion only has been removed, and the remainder is ready to stretch out when its surface is drawn together by the granulating action, and thus, in a great measure, supply the loss of substance. Something of a similar description occurs in sloughing of the tongue or *glans penis*,—the swelling which attends the preceding inflammation making the part concerned appear much larger than it really is, so that, though the destruction is only partial, it may be thought complete. On all occasions, when a sore heals by the granulating process, there is great risk of supposing that the cavity is filling up, while, in truth, the bottom remains at the same level, and

appears to rise from the surrounding skin descending toward it, just as the banks of a river seem to glide past the observer, who is carried smoothly on by the current. The best evidence as to this is afforded by sores seated over bones or other fixed points, between which and the surface of the granulations the distance is not found to increase. In the old way of performing amputation, by cutting all the parts of the limb nearly on the same level, a large granulating surface resulted, which, if successive layers of organized structure were really formed by it, should have grown out into a bulbous shape. But, instead of this, it is well known that just the opposite condition took place, and that the surrounding skin was drawn in a puckered form closely round the bone. In short, the healing of an ulcer should be regarded as an action not of effusion or new formation, but of absorption or contraction; and it will be found, on considering the treatment of ulcers, that whatever causes swelling of the part concerned impedes, while everything productive of an opposite effect tends to hasten, the progress of recovery.

When an ulcer is examined by dissection, the cellular substance lying under and around its base is found more or less infiltrated and condensed with lymph; but the granular covering is very thin, being limited to the crust effused in the first instance, and subsequently organized. The texture under the thin pellicle of the granulations is liable to be distended with blood or serum, which occasions a state similar to œdema, and elevates the surface of the ulcer so as to present the appearance which is commonly named *proud flesh*. Morbid nutrition may occur in the same situation, and then growths of various size, form, and appearance spring up; but these, so far from having any share in the process of cure, tend to delay or entirely prevent it. It may be asked, why should not the natural structures be regenerated, if diseased ones are thus formed? But it should be recollected, that all we know of the laws of nature is learned from observation; and mere analogy, in opposition to well-ascertained facts, affords no reason to expect any reproduction of lost parts in the human subject. There are other circumstances under which regeneration takes place more readily—that is, when the parts concerned do not communicate with a breach in the surface of the body. An interstitial process then goes forward, consisting of the effusion

and organization of lymph, which frequently forms a substitute nearly or altogether similar to the original texture. The nerves, tendons, periosteum, bones, and ligaments are thus frequently restored, after suffering more or less extensive destruction.

Treatment of Ulcers tending to Heal.

So long as the granulating process proceeds, as has been described, it requires no local treatment, except what is necessary to prevent it from being disturbed by external irritation. Great attention to cleanliness ought to be observed with regard to the parts surrounding the sore, which should be frequently washed, and shaved if there are any hairs upon them. There is no use or propriety in scrubbing the surface of the ulcer itself, as is frequently done, since the pus affords a natural covering to protect it, and would be sufficient for the purpose, if it were not that the risk of injury from contact with external bodies, and the unseemliness of an ulcer exposed to view, require some artificial covering. Old linen, lint, or charpie may be employed for this purpose; and perhaps the last-mentioned article is the best, as, being more porous, it allows the pus to pass readily through its interstices. Whatever be the covering employed, it should be moistened with water, and prevented from drying by a piece of oiled silk, or thin gutta-percha, laid over it. The ulcer requires to be dressed frequently, in proportion to the quantity of discharge. Once in the twenty-four hours is generally sufficient, but twice is often necessary—and sometimes the interval may be extended to two days or more.

One granulating surface may unite with another, when they are placed in contact, and retained together. The cure is thus sometimes greatly abridged, and at other times very troublesome adhesions may result, as when the respective surfaces of the fingers are ulcerated from any cause.

Treatment of Contractions caused by Cicatrization.

When the ulcerated surface is extensive, and the integuments surrounding it are easily drawn together, as is the case after burns of the throat, great deformity and inconvenience are frequently

occasioned by the contracting effect of the granulating action, rendering the cicatrix so small as to keep the parts about it permanently displaced and immovable. Mere division of the contraction is hardly ever sufficient to remedy the evil, as the firmness of the cicatrix prevents the edges of the cut from being separated much, and any relaxation thus gained is almost always lost during the subsequent cicatrization. An ingenious method of treatment was proposed by Mr. Earle—namely, to cut out the cicatrix entirely, and then unite the edges of the wound laterally, if possible, by the first intention, but, at all events, so as to prevent contraction in the longitudinal direction. In favorable circumstances for its performance, this operation answers extremely well, but these are unfortunately seldom met with; and it is obvious, that if the cicatrix be broad, or of much extent in proportion to the size of the part affected, no benefit could be derived from its excision. It is an important fact, that the cicatrix, while still recent and vascular, may be extended by mechanical force cautiously and perseveringly employed, since deformities from contraction may thus be not only prevented but sometimes completely remedied. In the case of a girl, whose fore-arm, in consequence of a burn, was drawn up almost close to the arm, a complete cure was effected by one of my pupils, in the course of a few weeks, through the use of an iron wire splint, fitted to the shape of the contracted limb, and gradually expanded.

Treatment of Ulcers not tending to Heal.

Ulcers are prevented from healing by many different circumstances, which have led to a variety of complicated classifications for their arrangement. As the effect of these has generally been to perplex instead of simplifying the subject, it seems better to adopt an easier system; and the three following heads will be found to comprehend the whole:

1. Ulcers which are prevented from healing by defect of action.

2. Ulcers which are prevented from healing by excess of action.

3. Ulcers which are prevented from healing by peculiarity of action.

The circumstance which has occasioned the ulcer, the part of the body in which it is situated, or the peculiarities of the patient's system, sometimes at once denote its nature; but in general this can be learned best by carefully examining the distinctive features that are presented, in respect—1. To the surface of the ulcer, which may be level with the surrounding skin, depressed below it, or elevated above it, concave, smooth, or irregular; 2. The shape of its edges, which may be regularly curved and smooth, or eroded and angular, round or sharp, undermined and inverted, or thick and everted; 3. The quantity or quality of its discharge, which may be purulent, bloody, or serous, thick or thin, copious or scanty, fetid or inodorous; 4. The kind and degree of the pain proceeding from it; 5. The condition of the surrounding and subjacent parts, which may be hard or soft, inflamed or natural; and, 6. The mode of its cicatrization, which may proceed from the circumference to the center, or from the center toward the circumference—on a level with the surrounding surface, elevated above, or depressed below it.

Ulcers prevented from Healing by Defect of Action.

The defect of action has been thought to depend sometimes upon a real want of power, and at others upon a want of disposition to exert the power that exists. The ulcers of this kind have accordingly been divided into Weak, and Indolent or Callous, which exhibit different characters and require different treatment.

In Weak Ulcers the surface is generally higher than that of the surrounding skin, and exhibits large flabby granulations, which are either of a dark color, like that of venous blood, or pale and œdematous. The edge is smooth and flat, or gently rounded; the discharge thin, watery, and generally profuse; the pain usually inconsiderable. The parts surrounding and subjacent, constituting what is called the stool or base of the ulcer, are soft, and free from any indurating effusion. The cicatrix forms round the margin, and is generally at first elevated above the proper level, to which it usually descends afterward, owing to the contraction that takes place subsequently to its completion.

This kind of ulcer occurs in parts which possess weak powers

of action, either on their own account or on that of the system. The general weakness is most frequently observed in children; but may be induced at any age, by deficient nourishment, an unwholesome atmosphere, etc. The local weakness may depend on the cause which occasioned the ulcer, or simply on the long duration of the healing process. With regard to the first of these, it may be stated that, whenever the solution of continuity is effected by means which injure the parts concerned, as by lacerating, bruising, or burning, it displays the characters of a weak ulcer; and, as to the second, it is sufficient to observe, that every ulcer tends to become defective in action during the process of cure; so that, if considerable in size, it is sure, sooner or later, to display the features indicative of this condition.

The treatment of weak ulcers consists in employing pressure, together with stimulating and astringent applications locally; and, if necessary, strengthening the system by the administration of wine, bark, bitters, and nourishing diet. Of the local applications, ointments used to be most employed; but the preference is now generally given to various metallic solutions, such as those of the sulphate of zinc, acetate of lead, and sulphate of copper, in the proportion of from one to three grains to the ounce. It seems probable that the moist nature of these applications is of more consequence, in producing the effect desired, than the substances dissolved in them, since water alone answers very well for the purpose. These lotions, or washes as they are called, ought to be varied occasionally, as habit lessens their effect. Pressure is always useful, and ought to be exerted by proper bandages. Several folds of moistened lint should be laid over the sore; and between the lint and bandage it is proper to interpose a piece of oiled silk, to prevent the lotion from soaking away and leaving the sore dry.

The Indolent or Callous Ulcer is distinguished by a smooth surface, generally depressed, of various colors, brown, gray, or white, having no appearance of granulations, and looking as if varnished; a viscid tenacious fetid discharge; a circular or oval figure, with little irregularity; and thick white edges, seeming as if composed of accumulated cuticle. There is no circumscribed hardness in the immediate neighborhood of the ulcer; but there is always diffused swelling of the limb in which it is seated. The

swelling is not soft and yielding like that of common œdema, but firm and incompressible. The pain is very variable. There is no appearance of cicatrix so long as the sore retains its indolent characters.

Ulcers of this description are confined almost exclusively to the legs of people advanced beyond middle age, and constitute a very troublesome subject of surgical practice, as they are very apt to recur after being healed. Some people, partly from the fear of injuring the system by suppressing a long-continued discharge, and partly from the despair of effecting a permanent cure, bestow little care on the treatment of these complaints; but this is wrong, since the most unpromising cases, under proper management, are often remedied; and there is hardly any disease which interferes more seriously with the patient's comfort, or unfits him more for the active duties of life. This kind of sore is chiefly met with in the laboring poor, and often produces the greatest misery, by impeding or altogether preventing the exertions which are required for maintaining the patient and his family.

The treatment generally thought the most useful is rest in the horizontal posture, conjoined with pressure. The merit of fully establishing the advantage of pressure is due to Messrs. Whately and Baynton, the former of whom recommended a calico or flannel bandage, to be tightly applied from the toes upward to the knee; and the latter, in addition to this means, to make the compression more effectual, employed straps of adhesive plaster an inch or two broad, and long enough not only to encircle the limb, but to cross each other far enough to obtain a firm hold when drawn round the leg and across the sore. The limb having been shaved, a slip of plaster is applied an inch or two below the sore; then another a little further up, so as to leave a third of the former one exposed; then another in the same way; and so on, until not only the ulcer, but an inch of the skin above it is covered. Lastly, a cotton roller, three inches broad and five yards long, is applied from the toes upward. Unless the discharge is profuse, the sore need not be dressed oftener than once in two days. Under this treatment the swelling of the limb subsides—the callous edges speedily disappear—the surface of the ulcer granulates, discharges a purulent secretion, and cicatrizes as an ordinary healing sore. The good effects of this treatment are

usually ascribed to its stimulating the actions, which are supposed to be in an indolent state, and thus exciting a healing action in the sore. But the true explanation probably is, that it allows the healing action to proceed, by inducing an absorption of the swelling which occupies the limb, and which, though of secondary origin, inasmuch as it proceeds from the continued irritation of the ulcer, when once established, must oppose the contraction requisite for the process of cicatrization.

I have accordingly found that the application of a large blister, covering the sore and a considerable part of the limb, greatly hastens the cure, and generally proves sufficient for its completion, without the use of any other means. The immediate effect of this practice is removal of the swelling, so that the thick callous edges disappear, and the surface of the ulcer coming to be on a level with the surrounding skin granulates and cicatrizes. In favor of this treatment I may mention, that it is more speedy and lasting in its effects than the strapping process—and much more economical, which is a point of great importance in treating the poor people who usually suffer from the disease—since the expense of strapping and bandaging their limbs very often prevents the treatment from being undertaken.

Ulcers prevented from Healing by Excess of Action.

These ulcers have an irritable look, owing to redness of their own surface and that of the surrounding skin. In general they are deep, of a brownish-red color, and show no granulations,—they are irregular in shape—their edges are abrupt and usually ragged—their discharge is thin, serous, and often tinged with blood. Sometimes they are superficial—of a regular circular form—and exhibit no redness except a bright line at their margin. The pain attending them is almost always acute. They form no cicatrix so long as they retain the irritable characters. Irritable or overacting ulcers are met with in full overfed subjects, who possess strong powers of action, and in weak irritable individuals. They may also occur merely as the effect of continued irritation, whether direct or indirect.

The treatment consists in removing all sources of irritation, and using local applications which have a soothing tendency. Of

these, heat and moisture, as afforded by fomentations and poultices, are the best; and their effects may be increased by using decoctions of poppy heads, solution of acetate of lead with opium, etc. Scarification of the edges of the ulcer, or leeches, may also be employed if the symptoms are severe, but it is very seldom necessary to do so. Bleeding, purging, calomel, and opium must also be resorted to according to the state of the system, so as to reduce excessive power of action and allay inordinate irritability. In relieving the ulcer from irritation it should be recollected that motion has a powerful effect in causing or increasing it, and rest therefore ought to be strictly enforced.

Ulcers of this kind sometimes go on progressively enlarging, and are then said to be Phagedenic. When the overaction runs still higher, so as to destroy the life of the part, it constitutes what is called a Sloughing Ulcer. When mercury was given profusely and indiscriminately, in the treatment of venereal affections, it frequently induced such irritability as to make the sore assume phagedenic or sloughing characters. The patients in crowded ill-ventilated hospitals sometimes suffer from sloughing of their sores, attended with great destruction of the parts, or even fatal effects on the system. This Hospital Gangrene, as it is named, no doubt depends on the unwholesome atmosphere exciting preternatural irritability, and the treatment, therefore, essentially requires removal from the sphere of this deleterious influence. Other means will hardly be required if this be afforded, while the most careful administration of dressings and medicines will be of little avail so long as the grand desideratum is withheld. The age, strength, and previous circumstances of the patient may render it proper to vary the subordinate treatment by bleeding or stimulating, fomenting or cauterizing. The hospital gangrene, as described by military surgeons, is not met with in civil hospitals to such a formidable extent; but a degree of the same effect, proceeding from a similar cause, is of frequent occurrence, and demands similar measures for its remedy.

In the forms of this affection which I was accustomed to see in former days, when the accommodation for surgical patients in the Royal Infirmary of this city was not sufficiently extensive, the first sign of its commencement was the appearance of one or more

small superficial circular excavations, looking as if scooped out from the surface of the sore. They had a yellow or grayish-yellow color, and were devoid of granulations. Rapidly extending and coalescing, they entirely altered the aspect of the ulcer, which, at the same time, partly from swelling of its edges, and also from phagedenic action, became much increased in extent. A soft spongy slough of a dirty white color next presented itself, generally extending over the whole surface, but varying in thickness. While these local changes were in progress, and apparently keeping pace with them, a general derangement of the patient's system was observed. He acquired a sickly yellow aspect, lost his sleep and appetite, and had an extremely quick pulse, together with the foul tongue and all the other symptoms of feverish disturbance. By-and-by, in the course of a week or ten days, the state of matters usually began to improve; the sore gradually regained its former characters, and, though often very much increased in size, healed more quickly than might have been expected, the general health undergoing a corresponding change. After trying a great variety of treatment without any sensible benefit, I came to regard the attack as one that should be trusted very much to spontaneous recovery. It was more troublesome than dangerous; even in the cases of compound fracture and amputation, hardly, if ever, leading to the loss of limb or life, but merely protracting the cure. A poultice seemed the best dressing that could be applied until the sloughs began to separate, and the only internal remedies that appeared useful were laxatives in the early stage to regulate the bowels, and a moderate allowance of wine in the more advanced period of the complaint. The application of concentrated nitric acid has been thought useful in checking the unhealthy action.

Ulcers prevented from Healing by Peculiarity of Action.

It was formerly supposed that all the ulcers which resisted the means of increasing and diminishing action owed their obstinacy to peculiarity of disposition, whence they were named specific sores. It is now well ascertained that a very large proportion of these so-called specific ulcers depend on some irritation, direct or indirect, after the removal of which they readily heal. The most

common cause of irritation in such cases is that proceeding from suppression of the secretions, especially those of the digestive organs, the remedy of which consists in correcting the patient's errors in regimen, and subjecting him to an alterative course of medicine. For this purpose, nothing answers so well, in general, as restricting the diet, increasing the exercise, and prescribing daily doses of the carbonate of soda with rhubarb,—as half a drachm of the former, and six grains of the latter. The local treatment must be regulated by the condition of the ulcer as to excess or defect of action, but, generally speaking, lotions answer best, and of these the black wash, which is formed by decomposing calomel with lime-water in the proportion of eight or ten grains to the ounce, and a weak solution of sulphate of copper, are the most useful.

Ulcers depending on the suppression of other habitual discharges, such as the menstrual, should be treated on the same principle, the particular means employed being varied according to the circumstances of the case.

When an ulcer continues to exist without any local or constitutional irritation to account for its doing so, the obstinacy may then be fairly referred to peculiarity of action. This morbid disposition is either confined to the ulcer, or exists generally throughout the system. Specific ulcers may accordingly be divided into Constitutional and Local.

Specific Ulcers present every variety of character. Their color is usually gray, yellow, or purple; their surface is sometimes deeply excavated, at other times elevated into fungous growths, presenting a sort of cauliflower appearance. Their discharges vary without limit as to color, consistence, and quantity. The pain attending them is also very variable. The cicatrix exhibits various peculiarities in the mode of its formation, often commencing in the center or at one side, and shooting over the remainder of the area—or going on at one part while the ulcer extends at another—and being in general considerably depressed below the surrounding surface, but not unfrequently elevated into projections above it.

The treatment varies with the nature of the general or local disposition which maintains the ulcer. If it appears that the patient's system has been disordered by mercury, the best means of

promoting recovery is blistering of the sore surface, with the internal use of the iodide of potassium in small doses.

When the ulcer resists every means employed to induce a healing action, it is generally named a Cancer, the only remedy for which is extirpation. This may be effected by caustics, the ligature, and the knife. The first-mentioned means are proper where the sore is of no great depth, or of much extent; the second where hemorrhage might be profuse, and could not be easily restrained; while the third, or excision, is the easiest, least painful, and most certain method in the great majority of cases. The division of cancer into local or epithelial and general, which has been attempted, seems to rest upon a difference of degree rather than of kind, since every shade of liability to return after removal may be observed, between the total absence of any such disposition, and complete infection of the whole system.

The different morbid dispositions which have now been considered may exist together, so as to complicate the appearance and treatment of ulcers. An indolent ulcer of the leg, by intemperate living and the excitement of motion, frequently, in addition to its own characters, presents some of those which depend on irritation, such as redness and pain. These subside under the influence of poultices and rest, so as to leave the indolent characters alone. Specific ulcers show every variety of underacting and overacting characters, according to their particular circumstances, and consequently require a variety of treatment besides that which their peculiar nature demands.

CHAPTER VI.

SUPPURATION.

Pus.

SUPPURATION consists in the formation of a peculiar fluid named Pus, which possesses the following characters: It has nearly the consistence of cream; it has a pale yellow or straw color; it occasions no smell while cold, but when heated to the

temperature of the body emits a faint odor; it is opaque, and when examined by the microscope, appears to be composed of globules suspended in a transparent fluid; it sinks in water; it is coagulated by muriate of ammonia; and sometimes has its fluidity diminished merely by removal from the body.

It was formerly believed that pus originated from putrefaction or degeneration of the blood and other fluid or solid parts; and a loss of substance or breach in the continuity of the solids was thought essential to its formation. It is now ascertained that pus is produced by a peculiar secreting action of the capillary vessels, which may occur without any solution of continuity. The mucous membranes, after being inflamed, frequently take on the suppurative action; and the purulent secretion of granulations may be quoted as another instance, since the pus is discharged here at once from the vessels. A granulating surface in several respects bears much resemblance to a mucous membrane, and may be regarded as a temporary covering instead of skin. Pus varies very much in consistence, color, and other properties, from admixture of blood, the nature of the part, or the constitution of the patient.

Suppuration may be divided into superficial and interstitial.

Superficial Suppuration.

Superficial suppuration is that which takes place from the surface of the mucous membranes, as the urethra or conjunctiva. It was not admitted by the older surgeons, who accounted for the discharge in such cases either by calling it mucus, or by referring it to some solution of continuity out of sight.

Purulent discharge from a surface, or a running, as it is generally named, is in the first instance accompanied with symptoms of the inflammatory action which preceded it, particularly heat and redness, which require measures of a soothing kind, such as bleeding, purging, warm fomentations, etc. By-and-by these subside, and the discharge alone continues, when the treatment must be altered to the use of stimulating and astringent applications, such as metallic washes, ointments, etc.

Interstitial Suppuration.

When suppuration takes place within the texture of the body, there results a collection of pus, which is named an Abscess. The matter sometimes is diffused through the interstices of the cellular texture; but more frequently is contained in a circumscribed cavity, which is limited by the effusion of lymph, forming a sort of capsule or containing bag.

When inflammation terminates in the formation of an abscess, the pain loses its intensity and changes to a throbbing sensation. The tension also diminishes, but the swelling does not subside; on the contrary, it rather becomes more prominent; and when pressed upon by the fingers gives the feeling of a fluid contained in a bag, which is called Fluctuation. The particles of a fluid being equally movable in all directions, when pressure is made at one part, an impulse is necessarily communicated over the whole surface; and if the fingers be placed at different points, the extent of the cavity may be ascertained. When the collection of matter is small, or thickly covered, a very nice and practiced sense of touch, the *tactus eruditus*, is requisite for recognizing fluctuation. If the abscess, on the other hand, be very large, simple percussion at one point is sufficient to detect it. When the suppuration is extensive, or seated in any important region of the body, such as the joints or cavities of the trunk, its commencement and progress are usually attended with rigors of various degrees and duration.

It has been questioned whether or not suppuration may occur without being preceded by inflammation. There can be no doubt that the symptoms of overaction previously are often very slight, and they probably ought not to be regarded as essential; but in the great majority of cases, suppuration certainly is a consequence of inflammation.

The contents of an abscess may be removed by the powers of the system in two ways. They are sometimes simply absorbed into the mass of circulating fluids. This happens most frequently in the case of abscesses connected with the periosteum and lymphatic glands, as those of the groin; and it is worthy of notice, that, when such absorption takes place, no bad symptoms follow.

It is now generally believed, that when pus is formed within reach of the cavities of vessels, as in a recent wound where the effusion of lymph is imperfect, or within the interior of veins, so that it may enter the circulation without passing through the modifying operation of the capillaries—a portion is apt to gain admission, and, preserving its characters so as to be distinguishable by the microscope, become the source of purulent deposits in other parts of the body. Another, and in my opinion much more probable explanation of such secondary purulent deposits, as they are called, is, that, in certain local suppurations, the whole mass of circulating blood sustains an alteration in its condition predisposing it to secrete pus; just as during inflammatory fevers, while lymph is thrown out from the capillaries, it separates more readily than usual from the blood during coagulation, and presents the buffy coat. As the globules of the blood and pus differ but slightly from each other, it is easy to conceive that some slight change, attending this morbid condition, may occasion the appearance which has been thought to denote the presence of pus in the blood. Much more frequently the pressure of the matter causes absorption of the surrounding parts, and, in conformity with the general law that those yield to it most readily which lie nearest the surface, the covering of the abscess becomes thinner and thinner, so that the skin alone remaining, it projects from the distention of the fluid, and becomes so thin as to allow the color of the pus to be perceived through it. The abscess is then said to point, and soon afterward, the absorption still continuing, an aperture takes place, which allows the contents to escape. A discharge of matter issues from the opening for some time afterward, but gradually becomes thinner, and diminishes in quantity until the cavity is healed.

It is generally stated that this process of cure depends on a growth of granulations from the whole surface of the cavity, which is thus gradually filled up. But if this were the case, it is plain that there ought to be a permanent solid enlargement of the part concerned; for pus does not proceed from the breaking down or softening of the natural tissues, as was formerly supposed, and is merely secreted by the vessels into the interstices between them. It separates the muscles, condenses the cellular texture, and elevates the skin, so as to obtain room for its recep-

tion; but so soon as vent is afforded for its escape, all the parts that have been pressed aside resume their natural situation, the cavity of the abscess is thus at once greatly diminished, and the contracting effect of the granulating action which ensues upon its surface completes its obliteration.

Instead of waiting for the natural evacuation of abscesses, it is usual to make an artificial opening, in order to hasten the cure. This ought not to be done in general until the fluctuation is distinct, especially if the abscess be seated in a glandular texture, as the process of reparation is otherwise apt to be rendered slow and imperfect. On the other hand, if the abscess is left entirely to itself, the skin frequently becomes so thin and impoverished at the part where it points, as not to possess sufficient power of action for uniting with the subjacent surface, and requires to be divided to this extent, so that the patient suffers much more than he would have done if the abscess had been opened. When the patient is in great suffering—when there is reason to believe that the matter is forming under some thick fascia, or other covering that resists its progress to the surface—or when the matter appears to be diffused in the cellular substance—it is improper to wait for pointing, and it is impossible to make an opening too early. When the suppuration takes place in a gland, or any morbid structure, it is proper to let the abscess either open naturally, or at all events be completely formed before interfering with it. In other cases, so soon as the fluctuation can be distinctly perceived, and the abscess points, the opening should be effected.

After the matter begins to form, and before it is evacuated, poultices and fomentations are applied, as they are believed to hasten the process of suppuration.

Abscesses may be opened either by the knife or caustic. The former is infinitely less painful and more certain. The best instrument for the purpose is either a straight or curved sharp-pointed bistoury, which answers much better than the old-fashioned abscess lancet,—an instrument shaped like the common lancet, but of a larger size. The narrow blade of the bistoury allows the point to enter the cavity with little pain, and then being pushed through the skin from within outward, at the part to which it is desired the incision should extend, quickly com-

pletes the aperture. If the parts to be divided are too thick for proceeding in this way, the knife may be carried through them directly to the requisite extent. It is always right to make a large opening; and, as a measure for determining its size, that of the part of the abscess which points may be taken, if it does not exceed an inch and a half or two inches. After the matter escapes, so far as it is induced to do so by the contraction of the parts containing it, a piece of lint should be placed between the lips of the wound to prevent them from uniting by the first intention; but care must be taken that it is not so thick or forcibly introduced as to confine the discharge, and consequently oppose the obliteration of the cavity. When the bleeding has ceased, a poultice should be applied, but not before, since a troublesome hemorrhage may otherwise ensue. In some situations, great difficulty is occasionally experienced in arresting the flow from arterial branches divided by the incision, from their resisting the efforts of pressure, and not admitting the application of ligatures, owing to the softened state of the texture surrounding the orifices. In such circumstances the best method is to pass a needle through the integuments into the cavity, and then bringing it out so as to include the vessel in a ligature, which being tied, proves certainly effectual, and may be removed when it ceases to be required. The poultice may be continued for a few days to promote the escape of matter secreted by the surface of the abscess, and then simple ointment, or wet lint, supported with a proper bandage, should be employed until the cure is completed.

When caustic is used, it should be applied as if for making an issue; and in case it does not extend its effect through the whole parietes of the cavity, a knife may be pushed into the eschar or slough caused by its operation. Patients who could not bear the idea of having their sound skin cut, have sometimes comparatively little objection to this.

Some practitioners prefer caustic for opening abscesses, on the ground that, while making the aperture, it hastens the suppurative process. But if means for this purpose are required, there are others which can be used with more effect, and leave the opening to be made by the more eligible method of the knife.

When, owing to peculiarity of the part or patient, it is desirable to avoid making a breach in the surface, means should be used

to promote removal of the matter by absorption. The best of these are blisters, followed by pressure. The cases in which they can be used with effect are chiefly those of slow suppuration in the glands, and under the periosteum.

Abscesses are said to be Chronic or cold when the symptoms of inflammation which precede them are mild or not at all observable.

In such cases, the collection generally forms slowly and insidiously, so as not to attract attention until it attains a large size. Owing to the want of action that attends its origin, there is little effusion of lymph, and consequently little resistance to the extension of the matter, whence the swelling is often of an irregular figure, and readily changes its place according to the tendency of gravity. When the matter passes from one part to another, it constitutes what is called a congestive abscess. The contents of chronic abscesses are generally thin, and bear no small resemblance to whey, especially as they usually have flakes of curdy-looking matter floating in them. The superjacent skin is generally not altered in color.

These abscesses have little disposition to evacuate themselves spontaneously, as the matter readily extends itself, and thus does not occasion sufficient pressure to induce absorption of the external parietes. It is hence the more necessary to make an artificial opening, but this cannot be done without some danger when the collection is large. The surface of the cavity, which not unfrequently is capacious enough to contain several pounds of fluid, sometimes inflames, and produces such violent constitutional disturbance as proves fatal in a few days. More frequently the bad consequence consists in a profuse and long-continued discharge from the morbid surface, by which the patient's strength is gradually exhausted, and Hectic Fever, as it is called, is excited. In this condition, the patient becomes excessively weak and emaciated; the countenance is extremely pale, with the exception of a red patch on the cheeks, which contrasts remarkably with the whiteness of the other parts of the face and especially of the eyes; the pulse is quick and weak; he complains, particularly in the evening, of burning heat in the palms of his hands and soles of his feet; his skin is dry and hot; and he suffers from nocturnal sweats, often together with diarrhœa.

This kind of disturbance is the usual result of continued irritation operating on a weak subject, and one of its most common causes is the discharge that follows the opening of a chronic abscess. It used to be supposed that the matter occasioned the fever by being absorbed into the mass of circulating fluids, but this opinion is now abandoned, and the effects on the system are attributed to the irritation which attends its secretion. Though the expression Hectic Fever is sanctioned by long use and universal acceptation, there appears to be good reason for laying it aside, since it leads directly and unavoidably to erroneous ideas of the condition which it is employed to denote. Fever implies disturbance of all the corporeal functions; but in the hectic state, those of the stomach, brain, and many other parts, remain unaffected. Instead of Hectic Fever, therefore, it would perhaps be better to use the expression of Hectic Irritation. The effect of this irritation is to weaken the system more and more; at length fever is really induced—the patient shivers—his tongue becomes foul—he loses his appetite—and speedily sinks under the disease.

A method of treating chronic abscesses was introduced by Mr. Abernethy, which has generally been regarded as a great improvement, though often of doubtful expediency. It consisted in drawing off, at first, only part of the contents by means of a trocar, allowing the wound to heal by the first intention, and then repeating the puncture, with the interval of two or three weeks, until the collection was so reduced in size that the cavity could be safely laid open and healed from the bottom as an ordinary abscess. If the abscess is large, the patient should be confined to bed, and kept quiet for some days previously and subsequently to the operation; for if these precautions be disregarded, even though the wound should heal by the first intention, there will be a risk of inflammation. Care should be taken to prevent the entrance of air, not because it possesses any power of direct irritation, but because it promotes putrefaction of the remaining matter, and in that way gives rise to the most violent disturbance. If there is reason to suppose that the abscess is connected with any incurable disease in the bones or elsewhere, it ought not to be opened, unless proving the cause of pain or some other serious inconvenience, since doing so could only accelerate the patient's fate, and bring the surgical art into discredit. Such abscesses

often exist for years without suffering apparently any change, or giving the patient much inconvenience, but upon being opened speedily prove fatal.

Sinus and Fistula.

When an abscess is seated in parts of which the action is defective owing to local or general causes, the cavity that remains after its evacuation does not contract completely, but continues to secrete a discharge, which is generally thin and copious, and then constitutes what is called a Sinus. The surface, in course of time, becomes condensed and smooth, so as to resemble a mucous membrane rather than the granulated covering of an ulcer—and if the discharge be copious, or any source of irritation exist, lymph is effused around the cavity so as to thicken its walls and render them almost of cartilaginous hardness. In such a confirmed state, the sinus is named a Fistula; but this term is usually confined in its application to sinuses connected with the natural excretory canals, as the urethra or rectum, the contents of which, by passing through the preternatural channel, prevent it from closing, and cause thickening of its walls. This hardening, or callosity, was formerly thought to depend on a morbid disposition of the part, and to require extirpation as an essential step to the patient's recovery. The operations practiced on this principle were extremely severe, and one of the great improvements derived from the more enlightened pathology of modern surgery is their entire disuse, in this country at least. It is now found to be sufficient for remedying the induration to remove the cause of irritation that induced it, the methods of doing which will be explained hereafter, in connection with the different regions of the body which are apt to become the seat of fistula.

In treating sinuses, the objects are to promote granulating action on their surface, and to press their sides together. They are not healed by *filling up* any more than the original cavity of the abscess, but contract until they become obliterated, or close more directly by union of the opposite surfaces.

Great care must be taken to avoid confining the discharge of the sinus, since, if prevented from escaping, it distends the sides of the cavity; and, for the same reason, it is always proper to

afford the matter a dependent opening for its escape, either by enlarging the one already existing, or making a new one. The most effectual method of proceeding is to lay open the cavity throughout its whole extent by incision; and it is sometimes necessary to resort to this practice when milder measures have failed, or the result of experience in similar cases authorizes the surgeon to dispense with their trial. The patient, by means of nourishing food, together with all the other adjuvants to the recovery of general health, should, so far as possible, remedy weakness of action in the system, if there seems to be any fault in this respect. It is at all times of great consequence to prevent motion of the part affected. If the sinus is connected with any incurable disease, such as a carious bone that cannot be removed, or a malignant degeneration of the texture cancered, any severe measures would be obviously improper, and only those of the most soothing kind should be employed, with the view of affording that palliation which is all the case admits of.

CHAPTER VII.

DISEASED NUTRITION.

Tumors.

By Diseased Nutrition is understood an action of the capillary vessels, which, instead of preserving the tissue concerned in a natural condition, increases its size or alters its texture. The morbid growths thus resulting constitute the principal division of a most important class of surgical diseases, which are named Tumors. The term tumor implies enlargement of a part of the body beyond its natural dimensions, which may be owing to the effusion or accumulation of fluids, as in hydrocele; the displacement of organs, as in hernia; or morbid growths, as in wens.

Morbid growths include simple enlargements of the natural tissues, such as exostosis,—conversion of them into textures for-

eign to the healthy constitution of the body, such as cancer of the breast,—and the development of entirely new formations, such as fibrous tumors. Mr. Abernethy used the term tumor as synonymous with morbid growth, and restricted its application "to such swellings as arise from some new production, which made no part of the original composition of the body." As this would exclude many important enlargements of natural tissues which constitute tumors very deserving of attention, the more comprehensive definition that has just been stated seems to be preferable.

Morbid growths occur in almost every part of the body, but the glands and subcutaneous tissue are their most frequent seats. They are very variable in the rapidity and extent of their increase, but, generally speaking, grow quickly in proportion to their size; and, other things being equal, usually enlarge most vigorously when their situation is dependent. Anything that irritates, or tends to inflame them, promotes their increase; and opposite circumstances are attended with opposite effects; rest, low diet, cold applications, and leeches lessen the activity of their enlargement.

When inflammation attacks a morbid growth, it either terminates in resolution or mortification, or leads the way to some of the actions which have been described. But, whatever the action may be, it almost invariably proceeds in a peculiar sort of manner, so as to prevent a cure or any satisfactory termination. Morbid growths deserve great attention, not only on account of the distressing consequences which thus ensue, but also in regard to the deformity and inconvenience which they occasion directly by their presence. They may be removed in three ways,—viz., by absorption, mortification, and excision. In order to determine on the choice of these means, and execute them properly, it is necessary to be acquainted more particularly with the different kinds of morbid growths.

Mr. Abernethy's arrangement and nomenclature of tumors used to be generally adopted. He divided them into Sarcomatous and Encysted; the former being solid; the latter composed of a cyst containing matters of variable consistence.

Of late years, the microscopical investigation of morbid growths has been pursued with great assiduity, in expectation of its afford-

ing better characters for discrimination than those appreciable by simple inspection. But the hopes thus entertained have been very imperfectly realized, in consequence of the variations connected with diversity of texture; and it must be confessed that little, if any, practical advantage has been obtained from this source—while the trust reposed in it, by withdrawing attention from the diagnostics presented by the sensible qualities, attendant circumstances, and histories of tumors, has in many cases led to the most serious mistakes. It is not impossible that the microscope may yet penetrate the obscurity which now renders its observations so uncertain; and then the distinctive characters hitherto in use may be safely laid aside. But in the mean while I believe that a surgeon will best discharge the duty which he owes to his patients, by endeavoring to make himself independent of any such assistance, by careful study of the sensible characters. In doing so it will be necessary for him to recollect that the different and even remarkable seats of morbid growths are apt to approximate each other by a gradual transition, which frequently renders it difficult to draw a line of distinction between them.

Simple Sarcoma.

Of all morbid growths, the simplest and apparently most akin to the natural structure, is that which has been named Simple or Vascular Sarcoma. It seems to be chiefly composed of accumulated cellular tissue and blood-vessels. It sometimes exists as an independent tumor; but more frequently constitutes what are called simple enlargements of natural parts, as the testicle, or thyroid gland. It produces little inconvenience, except what proceeds from its bulk; and is recognized by negative characters,—that is, by not manifesting the peculiarities which distinguish the other kinds of morbid growth.

Of all tumors, this is the one which yields most readily to means that promote absorption; and these, accordingly, are chiefly employed in its treatment. Of local applications, blisters and stimulating lotions, with ointments containing mercury, iodine, and the hydriodate of potass, are the most useful—more or less pressure being at the same time applied. Mercury and iodine are also very serviceable when administered internally so as to

affect the system, care being taken that their use is not pushed too far so as to injure the patient's health. If the tumor during the treatment becomes red or painful, a few leeches should be applied; and the utmost care is to be taken throughout, that the patient's secretions are duly performed. In this way, chronic enlargements of the glands, and simple sarcomatous growths existing independently, may sometimes be dispersed. Should they prove obstinate, and occasion much inconvenience or deformity, the best method of removing them is excision, if the circumstances of the case, as to the situation and connections of the tumor, do not forbid it. Some attempts have been made to arrest the morbid nutritive action, or cause sloughing of the mass proceeding from it, by tying one or more of the nutrient arteries; but experience on this subject has hitherto been very limited and unsatisfactory.

Under the head of Simple Sarcoma may be arranged the excrescences named Wart and Polypus. The former is a growth from the skin, the latter from the mucous membranes. In both, the natural textures appear to be rather preternaturally extended, with more or less softening and relaxation of the structure, than subjected to any degeneration or morbid alteration of composition. Warts are met with most frequently on the hands, and on the thin skin which surrounds the outlets of the body—as the eyelids, lips, and prepuce. It must be here remarked, however, that most of the excrescences on the face, which are usually designated warts, really possess an entirely different nature, being altogether new formations which have nothing in common with the growth under consideration, except some resemblance of form, and require to be carefully distinguished, since the treatment which is proper for the one sort proves most injurious when applied to the other.

Warts admit of removal by the action of stimulants, such as strong acetic acid, or the concentrated solution of sulphate of copper; also by caustic, the ligature, and the knife or scissors. The first and last mentioned means are the best for the purpose—the former being employed when the growth possesses a soft consistence and broad base, the latter when it is firm and prominent.

Polypus is a growth of softer consistence, but varies considerably in this respect according to the part from which it proceeds. The lining membranes of the nose and uterus are its most fre-

quent seat; and next to them the rectum may be mentioned. It has usually a grayish-yellow color, and possesses little vascularity, with still less sensibility. The inconvenience caused by its presence is chiefly of a mechanical nature, but nevertheless often sufficiently distressing.

The treatment is either palliative or radical—the former consisting in the use of astringent applications, and the latter in removal by evulsion, ligature, or excision. The expression polypus, like that of wart, is often loosely and inaccurately employed to denote growths of a totally different character, merely from their occupying the same situation.

Adenoid Sarcoma.

Under this title may be comprehended growths resembling secreting glands in their structure, but varying in density from that named Fibrous by anatomists, to the softer consistence of some glandular textures, as that of the pancreas. They usually possess a nodulated, or what mineralogists call a botryoidal surface, and a compact homogeneous consistence, with the exception of small cells, variable in size and number; they are of a yellowish or gray color; and are inclosed in a capsule, which separates them from the surrounding parts. They are met with in all parts of the body, but occur most frequently in the vicinity of the parotid and mammary glands, which they compress, and thus cause to be diminished by absorption, so as at last sometimes to occupy their place, and appear to superficial observers a morbid degeneration of the glands themselves. They are seldom attended with any inconvenience except what their size occasions, but occasionally become the seat of uneasy sensations; they are not prone to any other action than that of their own nutrition; and after attaining a certain magnitude remain stationary, but in the course of time are apt to assume a more troublesome disposition.

The only efficient treatment is removal by the knife, and this in general may be easily done. The incision should be made freely through the integuments, and fairly down to the substance of the tumor; and in detaching the cellular connections, the knife

should be directed upon the surface of the growth, since it may be cut with impunity, while the neighboring parts by doing so are protected from injury.

Adipose Sarcoma.

One of the most common solid tumors is that which has very properly been named the Adipose, or Fatty Growth. The appearance of its structure is precisely what the title indicates, and bears the closest resemblance to that of the ordinary subcutaneous fat. It is generally of a somewhat darker, though sometimes of a lighter yellow color, and not so granular; it is surrounded by a thin capsule, which keeps it distinct from the neighboring parts, unless they happen to be pressed together by the patient's clothes or otherwise, when adhesions occur between them; it is generally of a more irregular form than would be supposed from its appearance while covered by the integuments, and frequently sends out long processes in various directions. The skin covering such tumors is not discolored, but usually shows some inequalities of surface, corresponding with the lobules of the growth. The adipose sarcoma occurs in every part of the body, and at all periods of life, but is most frequently met with under the integuments of the trunk in young females, and middle-aged people of both sexes. There are frequently more than one tumor in the same person. It tends to increase according to the principles already explained, and occasionally attains a monstrous size, so as to weigh ten, fourteen, or even twenty-seven pounds, which was the weight of one removed from the parietes of the abdomen by Sir A. Cooper. It generally occasions no inconvenience except what is caused by its bulk, but sometimes becomes the seat of uneasy sensations, and weakens, in some way not yet explained, the voluntary action of the neighboring muscles. It is not prone to any morbid action or degeneration, but has in some cases been found altered in this way.

In treating adipose sarcoma, it is found that the means which promote absorption have little or no effect, and that excision is the only mode of affording the patient relief, unless the tumor happens to have a very narrow neck, when the ligature may be employed, but not so advantageously as the knife, since the root

or part seated under the skin necessarily remains, and is apt to prove the source of a future growth. The capsule which surrounds the growth hardly adheres to it, except in the circumstance above mentioned of having been subjected to pressure, so that the dissection is extremely easy and readily performed. The incision should be made freely down to the substance of the tumor, which is then to be drawn outward and detached from the cellular connections by repeated applications of the knife directed upon its surface. The finger-like processes, often sent out on different sides, must be carefully disengaged in the same way from the sort of sheaths in which they lie, by alternately gently pulling and slightly scarifying them.

Fibro-cartilaginous Sarcoma.

The consistence of this tumor, as may be inferred from its title, is softer than that of cartilage, to which it bears most resemblance. It frequently occurs in connection with the tissue, sometimes growing out in a distinct mass, which is called an Enchondroma, and on other occasions expanding the bone into spicular processes, or an imperfect shell containing the morbid growth, which is then named osseous Osteo-sarcoma. Tumors of this kind are also met with in other textures, as the muscular, but wherever seated admit of remedy only by removal, and this may in general be done with a good prospect of permanent recovery.

Cystic Sarcoma.

Tumors are occasionally met with which, when divided, exhibit a cellular structure, the compartments being extremely variable in their relative as well as absolute size, and in the nature of their contents. Sometimes they are perfectly fluid, at other times viscid or glairy, and their color is of every kind, though most frequently yellow or white. Different cells of the same tumor often have dissimilar contents. Sometimes the tumor is entirely composed of cysts, at other times a variable proportion of solid substance is interposed between them, and this possesses the characters of fibrous sarcoma.

This Cystic Sarcoma, as it is called, tends to increase, and does

not appear to have any limits to the size which it may attain, as may be seen in the case of ovarian dropsy, which depends upon the great development of a cystic structure in the ovary. It is not prone to degeneration, and does not occasion almost any uneasiness, except by its bulk, causing deformity, impeding the movements of the patient, or pressing injuriously on important organs. It occurs most frequently in glandular structures, especially the ovaries, testicles, and mamma, but is also occasionally observed under the integuments of the trunk, more particularly the upper part of it, and rarely on the limbs. It is recognized by its imperfect fluctuation and bluish color.

The only treatment that this growth admits of with advantage is excision, which is effected with very different degrees of facility, according to circumstances. If the tumor be seated in a texture of limited extent, such as the mamma, it may be very readily removed. But if it commences simply in the cellular texture, it is apt to spread so widely, and contract such adhesions, as to render an effectual operation very difficult, or even impracticable. In such situations, it is therefore the duty of the surgeon to press upon the patient the propriety of early extirpation.

Carcinomatous Sarcoma.

The morbid structure which is designated Carcinoma is distinguished by its great firmness and almost cartilaginous hardness, whence it used to be, and still is, occasionally called Scirrhus. The dense texture which characterizes carcinoma does not constitute a uniform homogeneous mass, but has numerous interstices which are filled with a yellow or brownish-gray friable substance, and it is generally extended in the form of diverging bands which spread into the neighborhood. When the disease occurs in an organ of limited extent, as a lymphatic gland, it does not tend to diffuse itself beyond the confines of the part concerned, the structure of which it affects more uniformly than when seated in a tissue less distinctly bounded. As the disease proceeds, however, it at last breaks through this obstacle, and then spreads as has been already described. The carcinomatous action extends itself in a different way also, namely, along the absorbent vessels and glands of the part originally affected. It would seem, in

general, to take this course more readily than to pass directly from one tissue to another. As to the mode in which the morbid action is transmitted along the absorbents, there exists a difference of opinion—some thinking that matter must be conveyed through the vessels; others that the mere irritation of the disease, propagated along the coats of the lymphatics, is sufficient to account for the sympathetic affection of the parts in question. The fact is certain that glands, in the course of the absorbents leading from a carcinomatous tumor, are often thoroughly tainted, though the original mass remains solid, and contains no fluid matter in its interstices.

Carcinoma occurs most frequently in glandular or secreting structures, and the mamma, lips, skin, tongue, stomach, and uterus, may be mentioned as its most common seats. It seldom commences in people below middle age, and from forty to fifty may be mentioned as its favorite time of attack; but it is occasionally observed in persons much younger than this, even in those who are not more than twenty or thirty. I am not aware of its having been ever met with before puberty. The predisposition of parts to carcinomatous action seems to be increased by their suffering chronic enlargement and induration; and the disease is generally called into existence by some irritation either direct or indirect. Of the former, blows and bruises may be mentioned as those most frequently concerned, and of the latter, suppression of habitual secretions. The cessation of the menstrual discharge, though a natural event, almost always occasions more or less disturbance of the system; and this occurring at a period of life when, other things being equal, the tendency to carcinomatous action seems to be strongest, has been thought to exert great influence in exciting the disease. The disposition to the morbid action is sometimes so strong, that it begins without any local cause, and is then apt to occur in more parts of the body than one. The patient usually betrays the unhealthy tendency by a peculiar greenish-yellow complexion, and anxious expression of countenance.

The characteristic symptoms of carcinoma are hardness and pain. The hardness exceeds that of any natural texture, except bone and cartilage. The pain is usually of a lancinating or darting kind, not constant, but attacking the patient by fits.

Sometimes it is described as hot or burning, and is then usually more fixed.

Carcinoma tends to inflame and ulcerate. If the skin is affected, this takes place on the surface, in which a breach opens and gradually extends. If the disease be more deeply seated, an abscess is formed within it, which discharges its contents, and leaves a cavity ready to take on the same sort of action as the ulcer which is established in the other way. In both cases the ulcer makes no advance toward reparation, but proves truly specific and incorrigible, and is named a Cancer. The process is occasionally reversed, the morbid formation taking place round a sore which in the first instance does not present any malignant characters. The base and edges of cancer are of course extremely hard, since the excavation is formed in a carcinomatous mass. The ulcer is very irregular in the shape of its margin and surface; sometimes it is deep, and as if scooped out of the part; at other times, cauliflower-looking excrescences rise from it and hang over the edge. The discharge is generally profuse, bloody, and fetid. The pain is usually incessant, and of various kinds, but sometimes gives very little trouble. The patient loses appetite and sleep; complains of wandering pains and weakness of the limbs; becomes gradually exhausted; and at last dies, in general rather suddenly, before the period which might have been expected from the progress of the disease. The rapidity of its course varies greatly, a few months being sometimes sufficient for its reaching a fatal termination; while in other cases it exists for years with little change, or even remains stationary altogether.

The treatment of carcinoma in its different stages has engaged more attention than perhaps that of any other surgical disease; and it has been repeatedly believed that means of correcting the morbid action were discovered. More careful observation has uniformly proved these expectations to be fallacious: and it must be admitted that, so far as we know at present, there is no cure for carcinoma except extirpation. Much may perhaps be done in the way of prevention, by protecting those parts of the body most subject to the disease from the influence of irritation, at that period of life when the disposition to it exists most strongly. Tranquillity of body and mind, regularity in the secretions, and moderate diet conduce to the same effect. The pain of cancer

may be soothed by opiates, used both externally and internally. Hemlock poultices, lotions and ointments of acetate of lead, carbonate of iron, various preparations of arsenic, pressure, and an endless catalogue of applications might be mentioned, as having been more or less confided in for correcting the diseased action and instituting a healing one. They sometimes afford temporary relief, but *never* effect any permanent alteration to the better. The only proceeding that deserves at all to be considered a remedy for carcinoma, is removal of the morbid structure.

This may be done sometimes by caustics, such as sulphuric acid and the chloride of zinc, applied in substance or formed into a paste; but these means are very apt to destroy the disease only partially, and consequently do harm instead of good, by exciting greater activity in the portion that remains. The knife or scissors effect the extirpation most easily and securely. It would be subjecting the patient to useless pain, and bringing surgery into discredit, to attempt extirpation in cases where the extent or connections of the disease prevented its complete removal. It is also incumbent on the surgeon to search very carefully for glands in the course of the absorbents that may have become affected, since it appears that the result of operations for carcinoma, when the glands are affected, is almost invariably unsatisfactory, however perfectly they may seem to be taken away. The reason of this probably is, that the glands do not participate in the disease unless the system be strongly disposed to it, and consequently their removal, however freely and effectually executed, cannot prevent the patient's relapse. In performing the operation it is not sufficient to take away the mere indurated mass, as the surrounding parts are always more or less vitiated in their disposition. If the disease is seated in a distinct organ, the whole of it ought always to be removed, however small the part which is actually affected may be; and when the tissue concerned is not in this way circumscribed, the knife should be carried as wide as possible from the tumor.

Medullary Sarcoma.

The title of Cerebriform is perhaps more correct than that of Medullary, to designate the species of sarcoma which is now to

be considered; but as the general acceptation of the latter term has fully sanctioned its use, there would be no advantage in attempting a change.

The medullary growth bears a close resemblance to the substance of brain, not only in appearance, but also in chemical composition. When divided, it seems as if composed of irregular masses, inclosed, and separated from each other more or less completely by thin membranous septa, which become more obvious after the soft pulpy mass is removed by maceration or the action of alkalies. The consistence of the tumor, though in general pretty nearly that of the brain, is sometimes much denser; at other times more approaching fluidity than the natural state of this tissue. Its color also is subject to much variety, from almost pure white to the darkest red,—the difference in this respect seeming to depend on the quantity of blood which circulates through the growth or is effused into its interstices. The proportion of blood is sometimes so great, that the tumor, when divided, resembles a coagulum; but more frequently it exhibits merely spots or blotches, irregularly interspersed through the substance of the mass.

Occasionally, but not frequently, this morbid growth appears in the form of a cyst, the parietes of which, though of little thickness, are composed of the cerebriform structure, while the cavity is occupied by clear serous fluid, usually of a greenish color. It is then apt to be mistaken for distention of a bursa or an abscess; especially as the most common seat of the disease in this form is the upper and inner part of the thigh.

Medullary sarcoma may occur in any tissue of the body, but originates most frequently in the bones, testicle, mamma, and eye; next to which the subcutaneous cellular texture, brain, and lymphatic glands are the most common seats of its commencement. Like carcinoma, it extends both into the neighboring parts and along the absorbents. It occurs at all ages, but is most frequently met with in infants, and adults between twenty and forty. It is recognized by its soft semi-fluctuating consistence, which is sometimes very apt to make the swelling be regarded as depending on the presence of a fluid. The superficial veins become very much enlarged; but as they do so, though hardly to the same extent, in nearly all chronic enlargements,

this diagnostic mark must be considered merely as a corroboration of the more positive evidence which is afforded by the consistence, situation, and history of the tumor. The pain that attends it is extremely uncertain, being in some cases very severe, in others hardly perceptible.

This morbid growth, after attaining a certain size, tends to open and protrude the soft substance composing it. It does so by sloughing, the formation and evacuation of an abscess, or simply ulceration. In whichever of these ways the bursting, as it is called, takes place, the integuments covering the tumor first become red and adherent, then the breach is established, the substance of the tumor presents itself to view, and fungous excrescences usually shoot out from the cavity. The discharge that ensues is always profuse, and generally very thin, excessively fetid, and occasionally bloody. In some cases, pure blood is effused from time to time in considerable quantity; and hence Mr. Hay, of Leeds, who first gave a general description of the disease, named it *Fungus Hæmatodes*. This term cannot be applied with propriety, and leads to much confusion, because the fungous protrusions of medullary sarcoma do not always, or even generally, bleed, while a bleeding fungus may appear without being preceded by the medullary formation. There is nothing peculiar in the texture of such bleeding excrescences; and if the term *fungus hæmatodes* be retained, it should have its use confined to express simply the fact of there being a fungous protrusion from which blood issues.

Medullary sarcoma, in its advanced stage, is attended with a greenish-yellow complexion and general emaciation. If allowed to proceed, it sooner or later destroys the patient by gradual exhaustion. The rapidity of its course, like that of carcinoma, is extremely variable, and cannot be foretold according to any data with which we are as yet acquainted. The treatment of this disease is, in general, very unsatisfactory. All local applications and internal remedies are admitted to be totally useless, and the only mode of affording relief is excision; while, owing to the tendency of the morbid action to diffuse itself into the neighboring parts, whatever be their nature or texture, as well as the taint, or unhealthy disposition of the system, the operations for this purpose are very often followed by relapse. Unless, however, the

case does not permit complete ablation of the tumor, or there should be indications of the disease existing in other regions of the body, or the pulse is quickened by the local irritation,—in which case, so far as I have observed, recovery hardly ever follows an operation,—it is the duty of the surgeon to give the patient the benefit of the chance that is thus afforded; and, of course, the sooner that this is done the better, after the nature of the malady has been ascertained. The prospect of permanent relief seems most favorable when the disease is seated in the testicle or bones, and most hopeless when the eyeball is affected.

Nearly connected with this kind of growth is that which has been named Melanosis. The title was applied by Laennec to tumors possessing the same soft brain-like structure, but differing in regard to their color, which, instead of being white, was either dark brown, or black. In other respects, the diseases resemble each other so closely as hardly to require separate designations, affecting the same parts, following the same course, and requiring the same treatment. It may be remarked, however, that the morbid tendency, as shown by extension, reproduction, or simultaneous formation at distant parts of the body, is not, in general, nearly so active in the melanotic as in the ordinary form of cerebriform sarcoma, and that the prospect of benefit from removal by operation is consequently not so unfavorable.

Scrofulous Sarcoma.

The morbid formation usually called Scrofula presents different appearances, according to the tissue affected. In general, it constitutes rounded masses, or tubercles as they are named, which consists of a grayish-yellow, gritty, semi-organized looking substance. It sometimes is not condensed and circumscribed in this way, but exists in a diffused state, so as to produce more or less change in the structure concerned. In the bones, it is confined to the cancellated texture, the interstices of which it fills. In the synovial membrane it produces a remarkable thickening, softening, and conversion into a sort of gelatinous consistence. In the lungs, lymphatic and mesenteric glands, subcutaneous tissue, brain, and *dura mater*, it occurs in the tubercular form. It is not attended with pain, and hardly produces any inconvenience,

except by its bulk causing deformity, or pressing injuriously on important organs.

The morbid formations generally remain stationary for a longer or shorter period, and then are either absorbed, or, as more frequently happens, suppurate, so as to constitute abscesses, containing thin sero-purulent fluid, with flakes of scrofulous matter floating in it. When the matter is discharged, the restorative process advances slowly and imperfectly; indolent sinuses or weak ulcers almost always result; and owing to the situation of the disease, or the nature of the tissues affected, as may too frequently be seen in regard to the lungs and bones, a cure is, perhaps, never accomplished.

The disposition to scrofulous action exists most strongly in childhood, from two to fourteen years of age; but traces of its effects are sometimes observed much earlier, and it would be difficult to prove that its operation does not occasionally continue in the most advanced age. The morbid tendency may be inherited as a peculiarity of constitution, and is usually associated with light hair, blue eyes, a fine skin, and florid complexion; whence scrofulous children often appear very healthy and thriving until they begin to suffer from the effects of their peculiar disposition. The earliest external indications of its presence are, in general, swelling of the upper lip and *columna nasi*, with tumefaction of the edges of the eyelids. Many exceptions occur in which all these signs are wanting; and the patient, though of dark complexion, and exhibiting in other respects characters quite the reverse of those just mentioned, betrays the strongest tendency to the disease.

The scrofulous diathesis or constitution is not always equally well marked in the parents and their offspring; and its effects are much modified by circumstances. Whatever has a weakening influence on the individual seems to increase the morbid tendency. Youth or sickliness of the parents—bad nursing—unwholesome or deficient food—and especially cold with moisture, may be particularly mentioned as causing or contributing to this effect; and as, indeed, sufficient to induce scrofulous action without the presence of any hereditary taint. Persons who possess a scrofulous constitution are generally more liable to other diseases, and suffer from them more severely, than those whose systems are more

healthy in their disposition. It is usual to name all these affections scrofulous when they occur in such circumstances, and hence great confusion continually arises. In order to avoid this, it will be better to restrict the use and signification of the term to those diseases which consist in, or proceed directly from, the morbid depositions which have been described as the result of scrofulous action.

In the treatment of scrofula, the first object should be to obviate the circumstances which increase the hereditary disposition or produce its effect. The child should be carefully nursed, warmly clothed, and supplied with a moderate allowance of wholesome nourishing food. Cod-liver oil has been found the most powerful means of invigoration that can be employed for this purpose, in consequence, no doubt, of its nutritive rather than of any real or alleged medicinal qualities. Indeed, the internal use of iodine, to which the agency of this oil has been ascribed, so far from being beneficial, appears very much opposed to the object in view. If necessary, mild means should be used to correct derangement of the intestinal secretions; but nothing is more injurious than to keep up incessant irritation of the canal by frequently administering purgative medicines, the necessity for which may almost always be advantageously superseded by proper regulation of the diet and exercise. Should the indications which have been mentioned, or the parentage of the patient, lead to the persuasion that the disposition to the disease is very strong, the place of residence, if cold and moist, ought, if possible, to be changed for one that is dry and warm.

When the scrofulous depositions are actually formed, the greatest care must be used to guard against the operation of all direct and indirect irritations, which might tend to excite their inflammation or suppuration. The means proper for this purpose depend on the part of the body affected, and will be explained hereafter; but on all occasions it is right to attend to the climate, the regimen, and the secretions of the patient. Local applications seem to have little power in causing absorption of scrofulous tumors; and it should be carefully recollected, that the exciting influence through which they prove beneficial, if not duly regulated, may occasion inflammation and suppuration. When the abscess is seated in a part of the body exposed to view, as the neck, it be-

comes important to determine what mode of treatment will render the resulting cicatrix least observable. Sir A. Cooper strongly recommended a small puncture to be made with a lancet so soon as any matter is formed, and that then the remaining scrofulous substance should be squeezed out. The result of many trials leads me to conclude that it is seldom if ever possible in this way to effect evacuation completely. And what seems to be the safest practice, is to let the matter be very fully formed before opening the abscess, blister repeatedly, and then make a free incision. Various drugs are used empirically under the specious pretext of producing a gradual improvement on the patient's constitution. The muriate of lime is one of these; and there are people weak enough to believe the assertion that it sometimes requires several years to effect any salutary change. Such practice is merely a cloak for quackery, and as such, is not less useless to the patient than disgraceful to the profession. It was formerly believed that a miraculous power of curing scrofulous diseases, by simply touching the patient, belonged to the kings of England from Edward the Confessor downward, whence the common name of the disease still in use, viz., the King's Evil. The ceremony was performed at the commencement of summer, during which season there is a strong tendency to spontaneous recovery; and this may account for the belief in a superstition so absurd.

Encysted Tumors.

Encysted Tumors, or Wens, as they are called when of large size, consist of two parts—1. A bag or cyst of variable thickness, whence they have their title; 2. A quantity of fluid, semifluid, or solid matter forming its contents. They are distinguished, in reference to the nature of their contents, into meliceritous, atheromatous, and steatomatous, accordingly as they possess the consistence of honey, putty, or lard; steatomes often contain, mixed up with the lardy-looking substance, a quantity of hairs, which seem to grow from the inner surface of the sac.

Encysted tumors are of all sizes, but generally between those of a pea and walnut. They are seated immediately under the skin or mucous membrane, and chiefly abound on the head. They are also met with about the organs of generation, but not nearly

so frequently, and still more rarely over the limbs. It has been supposed that they are mere overgrowths of the natural sebaceous follicles or crypts which lie in the skin; and Dr. Sharpey has made known to me a curious observation, which would go to support this opinion, viz., that the substance, which may be squeezed out of the follicles in question, contains numerous small hairs, which can be readily seen through a microscope of moderate power. In some cases, the cyst is obviously of this origin, having an aperture in the skin of a size proportioned to its own; but these cases must be regarded as exceptions, and the completely subcutaneous position, with the usually entire, imperforated cysts of these tumors, afford good reason to regard them as altogether new formations.

Encysted tumors are sometimes, but very rarely, absorbed; and local irritation, as that of a blow, especially when it ruptures the bag, occasionally excites the action which effects their removal in this way. More frequently they remain stationary after attaining a certain size, or gradually enlarge, adhere to the skin, inflame, suppurate, and open. When the tumor inflames, the surrounding cellular substance becomes engaged, and diffused swelling, occasionally of large extent, ensues, attended with severe pain and constitutional disturbance. In such circumstances a free crucial incision should be made through the affected part, and then a poultice be applied until the sore granulates.

The best remedy for encysted tumors in their ordinary condition is excision. When the tumor is seated under the scalp, its cyst generally adheres so very loosely that the operation may be performed almost instantaneously, and with extreme facility, by running a knife through the long direction of the tumor so as to divide the bag and superjacent integuments, and then pulling it away with forceps, or turning it out with the handle of the knife. If the tumor is large, and has been subjected to pressure, the skin usually adheres to it at the most projecting part; and when this is found to be the case, an elliptical portion must be removed so as to include the conjoined integument and cyst. In other parts of the body, the bag usually adheres by its whole surface to the surrounding tissue, and must then be either regularly dissected out, or, if small, punctured, emptied, and touched with caustic.

General Observations on Tumors.

Though a very large proportion of the tumors met with in practice may be readily referred to one or other of the kinds that have now been described, it must not be supposed that the characters and disposition are always distinctly marked. Various combinations and gradations of structure, as well as properties, frequently present themselves, so as to render the diagnosis difficult and uncertain. In general, however, it is still possible to determine the predominant features, and form a correct opinion as to the nature of the disease. But tumors also degenerate or change their condition, in respect both to substance and action. Thus fibrous growths, after remaining for many years firm, circumscribed, movable, and devoid of pain, may become partially or completely softened, confused with the surrounding textures, fixed in position, and the seat of fungous excrescences. Similar changes are observed in the cystic, vascular, and even adipose growths. It would hence be often difficult to recognize the original nature of tumors presented in practice; but this is of little consequence, since, whatever it may have been, the existing characters must regulate the opinion and practice. Thus, as already stated, fibrous growths may, for a long period of years, retain their simple unoffending nature, together with its characteristic features, and at length undergo a change so as to assume the condition of cerebriform tumors, when they are found to constitute no less unsatisfactory subjects of treatment than if they had originally possessed the same malignant disposition.

This degenerating process sometimes occurs in a reproductive form, as is observed in the case of a tumor not unfrequently met with in both sexes at the time of life when youth is passing into maturity, and also, though more seldom, at both earlier and later periods, and which I have been long accustomed to describe under the title of Recurrent Fibrous Tumor. It generally occurs on the trunk, and especially on the dorsal region. The texture is usually white and somewhat fibrous looking, but sometimes can hardly be distinguished from the adipose formation, from which, indeed, it has in some cases been found to differ only in having a slight admixture of cellular substance, rendering it more white

and firm. There is at first no pain or other unpleasant symptoms, and the patient usually retains good general health. The operation for removal, in these circumstances, is readily undertaken, and executed without any difficulty or immediate bad consequence. But, sooner or later, after the wound is healed, another growth, or more frequently several of the same kind, appear in the neighborhood; and if these be removed, they are speedily succeeded by new productions, of which the consistence is softer, the enlargement more rapid, and the distinction from neighboring parts less complete. They also become painful, and inclined to ulcerate and fungate, and finally prove fatal to the patient.

In examining tumors with the view of ascertaining the nature of their structure, some practitioners are wont to explore their substance by introducing into it a flat needle, plane or grooved, to permit the contents, if fluid, to escape; and there may occasionally be so much difficulty as to warrant this practice. But, in general, all such liberties should be carefully avoided, as dangerous, from their tendency to excite the morbid disposition of the part, and less worthy of confidence than the information obtained by careful manipulation.

CHAPTER VIII.

BLOOD-VESSELS.

Arteries.

THE two great arterial trunks, the aorta and pulmonary artery, agree generally in structure and function, but differ remarkably in two respects. The branches of the former unite or anastomose freely with their neighbors, while those of the latter continue unconnected from their origin to their termination; and the coats of the aorta are prone to morbid action, while those of the pulmonary artery are hardly ever known to suffer from it. It is the aorta alone which affords subject for surgical practice.

The arterial tube is composed of three coats—1. The external

or cellular; 2. The middle or fibrous; and, 3. The internal or serous. The first of these consists merely of condensed cellular texture, and is therefore not recognized by some as a distinct tissue, being regarded rather as a modification of the cellular sheath which envelops other organs of the body. But the larger arteries and veins, where lying contiguous, have usually a covering of this kind in addition to the one in question, which, from its compactness, strength, and constant existence, ought certainly to be considered an essential constituent part of the vessel. The middle coat is composed of circular fibers, which, from their appearance and properties, have been referred to the elastic tissue; but also possess a contractile property. When examined in a large artery of the human body, or in the artery of a large animal, as the horse, they are distinctly extensible and resilient, so as to resemble the *ligamentum nuchae* of quadrupeds, and other similar structures. The elastic property of this coat must tend to preserve the vessel of a certain size, in opposition to the distending force of the blood, and the effect of any vital contractile power resident in the arterial tissue. That the arteries do possess such a power cannot be denied, since during life, and even for some time after death, at least after the extinction of sensation, they contract much beyond the limit determined by their elasticity, whenever they are freed from the distention of their contents. The internal coat is distinguished by its thinness and smoothness; it is probably lubricated by a secretion from its own surface,—and resembles the membranes which line the cavities of the body, whence it is named the Serous coat.

All of these coats are vascular, and capable of performing the actions, whether healthy or morbid, which are exercised by the nutritious system of other parts; but the internal one is most subject to disease, and generally seems to be the source of alterations from the healthy structure, when they occur in the other constituent parts of the vessel. The actions which take place in it most frequently and readily, are effusion of lymph, and diseased nutrition.

Effusion is induced as an immediate effect of various local irritations, such as pressure or wounds; on which circumstance are founded the various methods of obstructing arteries that have been proposed in the treatment of disease. It is ascertained from

experiments made on dogs and horses, that, if an artery be subjected for some hours to the pressure of a tight bandage encircling the limb, the canal of the vessel sometimes becomes impervious. This effect results more surely when the sides of the artery itself are directly compressed; and Dr. Jones discovered that, when the internal and middle coats are divided, lymph is effused so copiously that obstruction frequently ensues, though the constriction be not continued after the division is effected. Desault had ingeniously contrived to do this by tying the vessel tightly with a firm round ligature, which, making no impression on the tough external coat, but dividing the soft yielding ones within, could be removed so as to leave the former entire, and the latter completely cut. Various attempts have been made to obliterate the arteries of the human subject by such means. Assalini employed little forceps, the blades of which could be approximated with regulated force by a screw passing through the handles. Mr. Travers conjoined pressure with division of the inner coats, by tying a ligature tightly with a slip-knot, and removing it from a few hours to two days afterward. These ingenious and reasonable trials occasionally proved successful in practice, but the results have been very irregular. The obliteration of human arteries, though accomplished by the same process, appears to be not so readily induced or completed as in the lower animals. And there are few situations in which the vessels are sufficiently accessible to admit of the necessary manipulations for effecting a temporary obstruction. All proceedings with this view are therefore now abandoned, and the method invariably followed consists in tying the vessel firmly with a small round silk ligature, which is left to be detached by the ulcerative absorption instituted through the irritation caused by its presence; the effusion of lymph that directly succeeds its application sealing up the cavity both above and below, so as to prevent hemorrhage during the process of separation.

M. Amussat of Paris contrived another method of obstructing large arteries, which generally succeeds in the lower animals, and has also been executed with success on the human subject. It consists in seizing the bare coats of the artery transversely with two pairs of forceps, and then separating the two instruments from each other so as to rupture the internal coats and throw them into folds. The effect of this procedure is interesting in

respect to the pathology of the arteries, but will not probably be preferred in practice to that of the ligature.

Lymph is also effused from the arterial coats as a consequence of inflammation; and the spontaneous obstructions which thus ensue deserve much attention. Though probably not very uncommon, they escaped observation until lately, and are yet far from being generally known. The inflammation may be limited to a small part of the vessel, or affect nearly the whole of the arterial system. The circumstances immediately concerned in its production are unknown; but it is observed to be nearly confined to adults at or beyond middle age, having a bad habit of body. According to its extent and violence, the patient feels pain in the region of the vessels concerned, which is aggravated by pressure or motion, and attended with more or less fever. As, from the depth of the vessels, there is no external appearance of disease, these symptoms are usually referred to rheumatism, and medical aid is not required until inconvenience begins to be experienced from the obstruction in the circulation which ensues; at least such has been the case in nearly all the instances of this occurrence hitherto recorded. The impoverished limb becomes cold and numb; and if stimulating means be employed to rouse the weakened actions, they readily excite inflammation, which speedily runs on to gangrene and mortification. On dissection, the vessels are found contracted, thickened in their coats, and firmly plugged with a dense, brown, fibrinous coagulum. The internal coat is sometimes ruptured or irregularly lacerated, so as to impede the channel of the vessel. Obstruction of the vessels with coagulum used to be considered a regular consequence of mortification; but it is now ascertained to be by no means a common occurrence; and when it does happen, ought probably rather to be regarded as a cause than an effect of the mortification. The plugging is now generally ascribed to fibrinous clots, or excrescences detached from some other part of the circulating system, and impacted at the seat of obstruction. The cases of this Embolism, as it has been called, seem to be by no means rare; and may account for the sudden stagnation of blood which is observed in cases where there was no preceding inflammation, or any injury of the arterial coats discoverable on examination after death or amputation.

Opportunity is seldom afforded to treat the primary inflammation, and its diagnosis would not be easy. In case of its being discovered sufficiently early, the proper remedies would be local bleeding and fomentations, with calomel and opium given internally. After the obstruction is completed, which may be learned by the coldness, numbness, want of pulsation, and history of the case, the utmost care must be taken to protect the weakened part from depression on the one hand, and excitement on the other. It ought to be warmly clothed, but guarded against external heat and all other stimulants. Should mortification ensue, amputation ought to be performed above the obstruction, unless a line of demarkation appears lower.

Diseased nutrition of the internal coat is a very common occurrence, especially in advanced age and unsound constitutions. The consequence of it is a deposition either of a soft pultaceous substance, which is named its atheromatous degeneration, or of calcareous scales, which constitute what is called ossification of the artery. In both cases, this morbid change affects principally the inner coat, a slender film on the surface of which remains as a lining to the vessel. The two diseased alterations generally exist together, in variable proportion. They affect most frequently the aorta, and arteries of the inferior extremities. They seldom take place extensively before the age of sixty; but are then so common, that they might almost be regarded as natural occurrences. Males are more subject to them than females. When a large artery becomes ossified it usually dilates, and thus transmits the blood more readily than might be expected from the thickening which it suffers; but the smaller ones become lessened in their capacity, so as to render the passage much less free than in the natural state; and the patient complains of weakness, pain, and other uncomfortable sensations, with more or less emaciation in the part of the body where the vessel is distributed.

Wounds of Arteries.

When an artery is wounded, the blood issues from it with great force in a stream, which is either continuous, or varied by successive pulsatory jets, according to the size of the vessel and the

aperture made in its coats. Unless the artery concerned be very large, or particularly circumstanced, as will be explained hereafter,—in which case hemorrhage does not cease until the individual has suffered a fatal depletion,—the flow of blood gradually diminishes, and after a time ceases, when the wound heals as it would have done in other circumstances. Various explanations have been offered to account for the spontaneous cessation of arterial hemorrhage. Petit (1730) referred it to the coagulation of blood, first without and then within the orifice of the vessel, so as to form a sort of cork or stopper to it. Morand (1736), in addition to coagulation, insisted upon there being also contraction of the mouth of the artery, both as to length and width, so that it assumed a conical form, which retained the clot. Pouteau (1760) rejected the preceding explanations, and referred the whole effect to injection of blood into the cellular substance. Dr. Kirkland (1763) maintained, to the conviction for a long while of most surgeons in this country, that the process consisted in shrinking and obliteration of the wounded vessel up to the first branch that came off above the injured part. In 1807, Dr. Jones proved, by a full and conclusive course of experiments, that none of these opinions were correct,—that the process in question was a complicated one,—and that it consisted of various distinct steps. He ascertained that, in the first place, the extremity of the artery contracted somewhat, and withdrew itself by retraction; that then the blood was injected into the surrounding cellular substance, especially that of the sheath, and coagulated there, after which a coagulum formed first on the outside, then in the interior of the orifice of the vessel; and that, lastly, lymph being effused from the cut edges of the arterial coats, became gradually organized, so as to complete the obstruction. In the course of time the artery contracted up to the first branch, and the clots were absorbed, when the cure might be considered complete. When the artery which has been wounded is prevented from retracting by its firm connection with the neighboring parts, or by being only partially divided, or when the surrounding cellular substance is either very dense or very lax, this process is impeded, and the hemorrhage proves more obstinate than in ordinary cases. On the contrary, when an artery is not cut, but torn across, it seldom bleeds at all,

even though of large size, because the external or cellular coat being the last to give way during the stretching of the artery, when at last ruptured, is elongated beyond the internal and middle ones, and instead of resuming its relative situation with regard to them, collapses into a conical form, so as effectually to close the orifice. This explanation I ventured originally to give on the authority of experiments repeatedly performed, and as affording a more satisfactory explanation of the fact than those previously offered to account for it, viz., that arteries retract more when torn,—that the edges of the orifice are killed by the violence, and therefore induce more speedy coagulation of the blood,—and that the internal coats are more extensively ruptured than the external one, so as to form irregular folds or projections into the cavity. Every opportunity of ascertaining the truth through actual examination, and they have not been few, has tended to confirm this opinion, by showing that the internal and middle coats terminate abruptly with a smooth circular edge, as if cut by a ligature, and that the external one forms a conical bag containing coagulated blood.

In some constitutions there is a remarkable disposition to bleed, so that the slightest wounds become troublesome, or even dangerous. This hemorrhagic tendency is generally observed most distinctly in children,—is associated with both fair and dark complexions,—is frequently hereditary, and can be discovered only by experience of its effects.

The means employed artificially for conducing to the cessation of hemorrhage, may be referred to the ligature, pressure, and styptics. The use of the ligature was introduced by Ambrose Paré in the latter end of the sixteenth century. He, and still more his successors, applied it injuriously by including a portion of the surrounding tissues to give it a secure hold. Paré employed large broad-bladed forceps, called crane-bill from their shape; but the instrument generally preferred was a curved needle, which, being thrust through or around the vessel, together with the parts adjoining, subjected to the ligature a mass not only quite superfluous, but which likewise was apt to occasion great inconvenience by shrinking subsequently so as to render the ligature loose, by delaying its separation, or by exciting inflammation. Mr. Bromfield (1772) pointed out the propriety of

tying merely the coats of the vessel, and introduced into general use for this purpose the Tenaculum, which had been previously recommended by Cheselden. It consisted of a sharp, curved, round needle fixed in a handle, and was employed to transfix and draw out the mouth of the artery so as to let the ligature be tied about it. The common dissecting forceps, until lately, almost superseded the tenaculum, as rendering the insulation of the vessel more easy and complete; but are now little used, in consequence of the more convenient instrument, known by the title of "catch forceps," having been introduced. The best material for the ligature is that sort of silk named "purse twist." It ought to be waxed previously to being used.

When the artery wounded is of large size, it must be tied both above and below the opening, as the anastomosing branches would otherwise maintain the hemorrhage from the inferior orifice. If it is necessary, in order to apply the ligatures, to expose the artery more fully, this should, if possible, be done by dilating the original wound, since there is apt to be much difficulty in finding the aperture when the surgeon cuts down on a different side of the vessel from that which is punctured.

In tying an artery which has bled repeatedly, it is necessary to beware of mistaking for the orifice of the vessel a fibrinous cylindrical extension of it, the ligature of which could not produce any permanent or beneficial effect.

Pressure may, on many occasions, be employed to suppress hemorrhage more conveniently than the ligature, as when the artery is but small, or lies over some unyielding part which can afford good counter-pressure,—or is much branched and freely connected with neighboring arteries of large size, so that several orifices would require to be tied,—when it is situated so deeply that the ligature could not be applied without a serious operation, —or is in a state of ulceration. In wounds of the hands and feet, especially the palms of the former and soles of the latter, no method is so convenient for stopping bleeding as pressure. Lint or sponge may be employed to effect the pressure; but the former is on many accounts preferable. Folded portions of it, successively increased in size, constituting what are called graduated compresses, ought to be applied over the bleeding vessel, and secured by a proper bandage. Unless the first one is placed

directly on the orifice of the artery, the subsequent pieces, however firmly compressed, will have little effect, and therefore the wound should, if necessary, be dilated sufficiently to admit the lint. When the hemorrhage takes place into a cavity the parietes of which are firm and unyielding, it may sometimes be restrained by closing the outlets, so as to make the blood accumulate and press upon the orifices whence it issues. Thus epistaxis, or bleeding from the nose, may be arrested, and also hemorrhage from the uterus in the early months of pregnancy, by plugging the nostrils and vagina. Bleeding from a leech-bite may be arrested by transfixing the wound with a sewing needle and tying a thread tightly round it. In the same way was subdued a hemorrhage from the umbilicus of an infant, two weeks old, which I saw with Dr. Begbie, and where the actual cautery had been used in vain, at the suggestion of the late Dr. Hamilton, who said that the very few cases of the same kind previously seen by him had proved fatal. I passed two sewing needles crosswise as deep as possible through the conical cavity from which the blood proceeded, and then tied a thread round them.

Styptics are agents which, independently of any compressing effect, possess a power of checking hemorrhage. Of these may be mentioned the sulphates of copper, zinc, iron, and alumina, and the nitrate of silver; strong spirits, oil of turpentine, and the actual cautery; also soft spongy or powdery substances, such as dried lycoperdon, spiders' webs, and the agaric of the oak or amadou. This last constituted the famous styptic of Brossard, which possessed a very high reputation both in France and in this country toward the close of the last century. Before the proper principles for applying the ligature were ascertained and received, styptics were regarded as important means for controlling hemorrhage; but they are now very little used. M. Amussat endeavored to introduce a fourth mode of suppressing hemorrhage, which consists in twisting the mouths of the vessels. This *torsion* is effected differently, according to the size of the artery. When small, it is simply twisted; when large, the internal coats are first pushed back by means of one pair of forceps, while the extremity is tightly held by another. There can be no doubt as to the possibility of attaining the object on this principle; but the expediency of doing so seems much more question-

able. In the removal of a tumor, or any other considerable dissection, most of the arterial branches which throw out jets of blood, when divided, are speedily obstructed by the spontaneous process; so that at the conclusion of the operation only the few of larger capacity requiring ligatures present themselves to view. Now, if every bleeding point had been subjected to torsion in the first instance, it might thus seem to have been productive of great benefit, while, if applied to the larger vessels, it would not afford so complete security as the ligature. There is, accordingly, hardly any case in which the torsion proves useful except in wounds of the lips and cheeks, in which union by the first intention is very desirable, and almost certainly effected if the raw edges are placed properly in contact; while the coronary arteries and other branches of the facial cannot be tied without leaving threads apt to disturb the adhesive process, and, from the projection of their cut extremities beyond the surface of the wound, are very favorably situated for being twisted.

The bleeding, after it has been stopped, sometimes returns, when it is called secondary hemorrhage. If it has ceased spontaneously merely through the natural process, aided perhaps by syncope, which favors coagulation, the reaction of the system that ensues within an hour or two is apt to reinduce it. If arrested by pressure, it may return either at this time, or not until two or three days afterward, when the feverish excitement which is then occasioned by the irritation of the wound tends to promote it; and if a ligature has been applied, the ulceration by which it is separated, if too rapid or extensive, may cause a bleeding from three days to as many weeks after the infliction of the injury. When the hemorrhage, therefore, is considerable, the local means of restraining it ought to be assisted by those which produce a corresponding effect on the system, such as rest, quiet, low diet, cooling purgatives, and whatever else may seem likely to moderate the force of the circulation.

It has been proposed to obviate the immediately fatal effect of excessive hemorrhage by transfusing the blood of another individual into the veins of the patient. The experience hitherto acquired on this subject is very unsatisfactory. Indeed, the profuse depletion requisite to sanction such a proceeding is generally either accompanied with some incurable lesion of the system, or

happens in circumstances which prevent the preparations for it from being completed soon enough. The simplest and best mode of performing the operation is to fasten a bladder to the canula of a small trocar, or a small silver tube made for the purpose, with its extremity rounded and slightly curved, which being introduced into one of the veins of the arm, will transmit the blood received in the bladder as it flows from the vein of the person who affords it, and descends into that of the patient by its own weight, or the influence of slight pressure exercised on the bag. The various ingenious and complicated apparatus which have been contrived for effecting transfusion are less manageable than this very simple one, which may always be constructed extemporaneously, and are objectionable on account of the extensive surface of dead matter to which they expose the blood, besides the risk of injecting air that attends their use.

Aneurism.

By the term Aneurism is understood a sac containing blood, fluid or coagulated, and communicating with the trunk of an artery.

There has been much dispute as to the constitution of the aneurismal sac. Sennert, Severinus, Hildanus, Wiseman, etc. supposed that all the coats of the artery were destroyed; and that it was formed by the surrounding cellular substance alone. Forrestus, Ruysch, Dimerbroek, etc. thought that the artery was merely dilated; while Morgagni, Lancisi, Guattani, etc. maintained that aneurisms might result either from simple dilatation of the vessel, or from expansion of the cellular substance, and therefore divided them into true and false, accordingly as the artery was dilated or ruptured. Scarpa labored to prove that the former do not exist, there being always rupture of the internal and middle coats. He has not succeeded in establishing his opinion to the full extent, but has certainly ascertained that it is extremely rare to find the artery entire, and forming the sac by its mere expansion.

Aneurisms may be conveniently divided into true and false. The former being those in which one or more of the arterial coats remain entire; the latter, those in which the vessel is completely

ruptured, and the sac is formed by the surrounding cellular substance.

True aneurisms may be subdivided into those which consist of simple dilatation of all the coats, and those in which the external one alone remains entire. The former are very rare, and nearly confined to two parts of the arterial system: viz., the aorta, and arteries of the brain. It was formerly supposed, from careless observation, that aneurism of the aorta generally depended on dilatation of all the coats, but Scarpa showed that, in the great majority of cases, the inner ones at least were ruptured. Exceptions, however, are sometimes met with, in which there can be no doubt as to the integrity of the vessel. In the arteries of the brain, the external coat is very thin, and affords little resistance when the inner ones are destroyed by disease. Aneurism is therefore very rare in this situation, and when it does occur, depends on a general dilatation of the vessel.

The true aneurisms, in which the internal coats are destroyed and the external one alone remains, are much more common. Their shape is not so regular as that of the last-mentioned kind, since the external coat does not dilate uniformly round the circumference of the vessel, but usually expands on that side where the internal layers are ruptured, so as to form a sort of bag or pouch, which often has only a very narrow communication with the artery. The blood which is received into this cavity, being removed as it were from the current of circulation, and exposed to a surface different from that of the healthy vessel, has a double inducement to coagulate, and accordingly does so, not all at once, but by degrees, thus forming a succession of concentric fibrinous laminæ, which line the aneurismal sac and sometimes fill its cavity completely.

The arteries liable to this disease are almost all the great trunks of the system; and the parts of their course most frequently affected are those where they give off large branches, or are exposed by their situation to blows and sudden extremes of tension or relaxation. The aorta at its arch, origin of the cœliac, and its bifurcation, the carotid at its division, the axillary, the external iliac at the groin, and the popliteal, are the most common seats of its occurrence. The first step in the production of this kind of aneurism is the formation of a breach in the inner

coats, through which the blood, being constantly urged by the force of the heart, passes and gradually distends the cellular coat into a bag. The tumor thus caused must press upon the surrounding tissues, and, by its constantly increasing size, effect such a condensation of their textures as will greatly strengthen its parietes. The original breach or crevice can generally be traced either to a blow, sudden extension, and such sorts of injury, or to violent impulse of the heart attendant upon some severe exertion. It would be difficult for these means to rupture the internal coats of a sound artery, and if they did so, the speedy effusion of lymph would, we have reason to believe, in most cases at least, not only repair the injury, but obliterate the vessel. The artery, therefore, must in general be predisposed to suffer the process that has been described, by undergoing morbid degeneration of the internal coat, which renders it soft, easily torn, and unfit for performing the adhesive action. It has been already stated, that the inner and middle coats, though extensively altered in their texture, usually retain a thin membranous film, were it not for which, the frequency of aneurism would doubtless be much greater than it actually is; since in that case there would be no occasion for any particular force to cause the breach, and it would occur as a certain consequence of the atheromatous alteration. Males are more subject to the disease than females, probably for the double reason that their predisposition to unsoundness of the arterial coats is stronger, and also that they are more exposed to the exciting influence of violent exertion, which may operate in determining the morbid degeneration of the artery concerned, as well as in directly causing the commencement of the aneurism.

In false aneurisms none of the coats remain entire, and the sac is formed, in part of its extent at least, merely by the surrounding cellular substance. They are generally of larger size and more irregular form than those which retain part of the arterial coats in their composition, whence also their contents are usually more completely coagulated. They are produced in two ways: 1. By the formation at once of a breach through all the coats of the vessels together, which may be effected either by wounds or other kinds of violence, or by ulcerative absorption; 2. By the sac of a true aneurism giving way, so as to allow its contents to escape and distend the cellular substance into another bag. They are

therefore divided into primary and secondary; they occur much more extensively over the arterial system than the true kind, since they not only result from these, but may arise from almost any artery that is wounded, and are frequently connected with vessels of inconsiderable size, such as the temporal or radial, while those of spontaneous origin are limited to the larger trunks. It has been alleged that aneurisms may also be formed by the opening of an artery into the cavity of an abscess, but without any well-authenticated facts to support such a doctrine. Arteries lying near the surface of sinuses not unfrequently ulcerate and bleed, whence it may seem likely that the same thing should happen while the cavity of the abscess remains entire. But as sound pathology rests upon well-ascertained facts, and not upon mere probabilities or assumed analogies, the conversion of abscesses into aneurisms, so far as is known at present, must be entirely discredited.

The signs of aneurism are, a tumor, subsiding under pressure, and returning when relieved from it with a whizzing noise and thrilling feel; pulsation, or rather a forcible distending throbbing; feebleness of the pulse, coldness, numbness, and weakness of the parts beyond the disease, with œdematous swelling and pain, owing to pressure on the veins and nerves. When the aneurism is internal, these indications cannot always be recognized; but there are then generally others presented by the derangement of the function, which is caused by the presence of the tumor impeding the action of neighboring organs. These, however, are often not distinct, and at the same time are apt to be mistaken for the signs of other affections. The compressibility and pulsation of the tumor are the grand distinguishing characters of aneurism. They are most distinct when all the coats remain entire, because then the contents of the sac generally continue fluid; they are usually well marked so long as the external coat does not give way; but in false aneurisms, especially those of old standing, where the cavity is of large size and irregular figure, they are often very obscure, or altogether unobservable, owing to the extent of coagulation which is apt to occur in such circumstances. The pulsatory movement communicated to solid tumors by large arteries lying under them, is sometimes mistaken for the pulsation of an aneurism. This error will be

avoided by recollecting that in aneurism there is a general and forcible expansion of the whole sac, which can be perceived as distinctly when the tumor is embraced laterally as when the hand is placed upon it, while the deceitful impulse communicated by an artery to a tumor seated over it is merely a faint heaving upward, which can be felt only when the surgeon presses in the direction of the vessel.

The natural course of aneurism is to grow larger and larger, to change from the constitution of the true into that of the false kind, and then to terminate in one of the following modes: 1. The contents coagulate, and are absorbed with or without obliteration of the vessel; 2. The artery becomes obstructed from coagulation or the effusion of lymph, and ulcerative absorption of the parietes of the tumor allows its contents to escape; 3. The sac opens by ulceration or sloughing, without previous obstruction of the vessel. The consequence of the two first of these terminations is a natural cure; that of the third, hemorrhage.

The treatment of aneurism consists in the use of means which tend to promote one or other of the two salutary processes just mentioned. The earliest attempts of this kind were directed with a view to the second of them, and their rudeness was equaled by their severity. The sac having been opened by cutting or burning, its contents were turned out, and then the hemorrhage was restrained by repeated applications of the actual cautery, or some other powerful styptic. The introduction of the ligature for closing the mouths of arteries rendered this operation less painful, formidable, and uncertain; but the difficulty and danger attending it continued to be very great, and the instances of recovery were extremely rare. Surgeons, therefore, turned their attention to the other mode of natural cure, and endeavored to promote coagulation, by lessening the force of the circulation, through the effect of bleeding, low diet, and rest. This plan of treatment is usually distinguished as that of Valsalva. In addition to these means, Guattani recommended tight bandaging of the limb and tumor. Both methods were found to be extremely inefficient and uncertain, so that, though productive of less harm, they hardly afforded more benefit than the bloody proceeding which has been already described, and was in

those days called the Operation for Aneurism. Amputation of the limb affected was therefore generally preferred, until it fortunately occurred to John Hunter (1785), and much about the same time to Desault, that an effectual method of causing coagulation would be to obstruct the artery above the tumor, or between it and the heart, so that thus the natural cure by coagulation and absorption might be safely and certainly induced.

The first trials of this new practice were hardly so successful as was anticipated, owing to the vexatious, alarming, and not unfrequently fatal hemorrhage which attended the separation of the ligature applied to effect obstruction of the artery. To obviate this cause of failure various contrivances were employed. The ligatures were sometimes drawn gently, lest they should cut the coats of the vessel, or a little roll of plaster was interposed with the same view between the knot and artery. Ligatures in the form of tapes were employed; two or three of them were tied at some distance from each other, so as to compress a considerable extent of the vessel; and ligatures of reserve, as they were called, being introduced under the artery, beyond those which had been tied, were left loose, so that they might be drawn tight if occasion should require. Notwithstanding all these precautions, bleeding still occurred as often as before, and proved, if possible, even more unmanageable. In despair, therefore, of obstructing arteries safely in this way, attempts were made to obliterate them without inducing the ulcerative absorption which was requisite for the separation of the ligature. Simple compression of the vessel, division of its internal coat, and these two means conjoined, were tried for this purpose, but, as has been already stated, however promising they might appear from their results when practiced on the lower animals, they were found to operate very uncertainly on the human arteries. Though these experiments thus did not lead directly to any practical improvement, they occasioned such a series of extensive and accurate observations as had the happy effect of developing the true principles on which the bleeding caused by ligatures depends, and consequently showed how it was to be avoided.

The great source of danger was found to proceed from the ulceration which detaches the ligature going beyond due bounds; and it was ascertained that the circumstances most conducive to

this were extensive separation of the artery from its neighboring connections, the interposition of much foreign matter between it and them, or the irregular puckering of the coats by flat or twisted ligatures, also laceration and contusion of the neighboring tissues, caused by exposing the vessel with the fingers or any blunt-pointed instrument, which prevented union by the first intention and excited inflammation. Such being the case, it naturally followed that the most effectual method of preventing hemorrhage was to use a ligature small, firm, and round, to pass it round the artery with as little disturbance as possible to its connections, and to draw it tightly. It is to British surgeons, especially Messrs. Jones, Hodgson, Lawrence, and Travers, that the profession are chiefly indebted for establishing these principles, which render the use of the ligature in the hands of a good operator equally easy and safe. To them, also, and more particularly to Cooper, Abernethy, and Liston, together with Drs. Post and Mott in America, is to be ascribed the honor of leading the way, by their bold and successful operations, resting on the sound foundation of correct pathology, to the present treatment of aneurism, which contrasts remarkably, by its simplicity and safety, with the complexity and danger of the older methods.

The ligature should consist of waxed silk, and may in every situation be passed round the artery by means of a simple needle, after the sheath of the vessel has been opened merely to an extent sufficient for the purpose. One ligature only ought to be employed, unless the operator unfortunately denudes the artery too far, when he will diminish the risk of hemorrhage by introducing two threads and tying them as far apart from each other as the detachment of the vessel permits. Mr. Abernethy recommended this proceeding, together with division of the artery between the ligatures, as proper on all occasions admitting of it, in order to take off the effect of tension, and place the vessel as nearly as possible in the same situation with one tied after amputation, where the chance of bleeding is known to be greatly less. But the difference of the two cases in all probability does not depend on tension, while cutting the artery between the ligatures is attended with considerable danger of hemorrhage.

After the principal artery of the limb is obstructed, the capillary anastomoses of the branches which rise above and below the

impervious part afford a new channel for the conveyance of the blood, and in general one so free that little apprehension need be entertained of bad consequences from imperfect circulation. The dilatation of the small vessels which occurs before the operation, owing to the natural channel becoming more or less impeded by the disease, also contributes to prevent this. It has been thought by Dr. Parry of Bath, M. Maunoir of Geneva, etc., that new branches are occasionally formed, after a time, between the obstructed extremities of the artery, leading directly from the one to the other; but there can be no doubt that the alleged new vessels are really the old ones of the sheath, which become enlarged in a greater proportion than the neighboring capillaries, conformably with a well-ascertained law of anastomotic circulation, viz., that those branches have the greatest tendency to enlarge which lie most nearly in the course of the obstructed vessel. In order to prepare the new passage for nourishing the limb, it has been proposed to delay operating in recent cases; but the inconvenience attending a large sac, the contents of which are sometimes slowly and imperfectly absorbed, or excite irritation that induces suppuration, and the risk of the artery becoming diseased nearer the heart, more than counterbalance any slight advantage to be gained in this way.

However free the new channel may be, it is always inadequate, in the first instance, to afford the full supply of blood requisite for carrying on the various actions as usual. The limb becomes more or less cold and numb, and continues so for a longer or shorter time, seldom exceeding a few hours after the operation. It then rises in temperature even above that of the corresponding sound one, and becomes painful; at the same time slight pulsation may return in the aneurism. To prevent this overaction from proving excessive, and inducing mortification, all sources of additional excitement, such as friction with stimulants, hot fomentations, and the like, ought to be carefully avoided. When the stage of reaction subsides, which it does in a day or two, the limb still remains weak and liable to suffer from slight irritation, so that even the pressure of its own weight occasionally causes sloughing. The support of a flannel bandage will therefore be proper, and, with a similar view, though low diet and even bleeding may be proper previously to the operation, the patient ought not to have

his strength reduced to a very low ebb by depletion, or very rigorous diet during the cure.

The bad consequences of this operation are gangrene, hemorrhage, and suppuration of the sac. When the sloughing is of limited extent, and dependent on pressure or feebleness of the patient's general strength, it ought to be combated by appropriate local and constitutional remedies; but when it is extensive, and the result of general inflammation of the limb, amputation should be performed without delay, as high at least as the artery has been tied. There seems to be reason for suspecting that the mortification sometimes depends on the principal vein becoming obstructed, in consequence of the irritation suffered by its coats during the operation.

The hemorrhage usually occurs about the time when the ligature separates, which is generally from the fourteenth to the twentieth day after the operation; but it may likewise occur either much sooner or considerably later. It appears for the most part very insidiously, not exceeding a few drops, but recurs from time to time in increasing quantity, until the patient, after being perhaps repeatedly saved by syncope, is finally exhausted. Pressure, together with the means which tend to lessen the force of the circulation, may be tried in the first instance; but if the bleeding continues or returns, the surgeon must, without delay, either tie the artery near the heart, or amputate the limb.

Suppuration of the sac is a disagreeable, but not a very dangerous occurrence, since it seldom takes place until the artery has been obliterated, so that there is no great fear of bleeding, and little to dread but a foul and extensive abscess. Whenever the matter is actually formed, a free incision should be made to evacuate it, together with the clots; after which, the cavity being in the first instance gently filled with lint, is to be treated with stimulating lotions and pressure. In a case of large diffused popliteal aneurism, for which I tied the femoral artery, suppuration occurred seven months after the operation, and was followed, after evacuation of the matter, by a very copious bleeding, which proved, upon examination of the amputated limb, to proceed from the breach in the artery leading into the aneurism, the vessel having been obliterated by the ligature only to the extent of three inches.

The object of tying the artery being not to prevent the blood from entering the aneurism, but merely to cause such stagnation of its current as may induce coagulation, it was proposed by M. Brasdor of Paris to obliterate the vessel *beyond* the tumor, when circumstances prevented the operation from being performed between it and the heart. Some unsuccessful attempts have been made on this principle; but Mr. Wardrop has recorded several instances of its alleged more fortunate application. It is evident the operation cannot be performed with advantage, if a branch of any considerable size comes off between the aneurism and ligature, as this would allow the current of blood to continue; it could not be of any use in cases where, the sac being small and regularly dilated, the contents remain fluid; and the only occasions where it promises any benefit are those in which coagulation is already far advanced. But here the passage through the vessel beyond the tumor must be obstructed nearly, if not altogether, as much as it can be by the ligature; so that there consequently does not seem to be much probability of this operation being ever extensively introduced into practice.

Within the last quarter of a century, various attempts and proposals have been made to facilitate the treatment of aneurism, by inducing coagulation through other means than that of ligature. Of these may be mentioned galvanic acupuncture, injection of astringents such as the perchloride of iron, and pressure on the artery concerned. The two first of these have so little practical evidence in their favor, that they need not be more particularly considered at present; but compression of the vessels deserves more attention. More than fifty years ago, some cases of popliteal aneurism were remedied on this principle in Paris, but at the expense of so much time and suffering as to deter from its general adoption. It now appears, however, chiefly through the exertions of Dr. Bellingham, and other surgeons of Dublin, that with a well-constructed and carefully regulated apparatus the object may be frequently attained with a tolerable amount of pain and delay. On some occasions, a few hours have been found sufficient for the purpose; but in general a period of from two to four weeks is requisite.

The great argument in favor of this method is its freedom from the danger of hemorrhage which attends tying the vessel.

But it must be admitted, that while exempt from this objection, pressure is exposed to others, especially its risk of causing engorgement, inflammation, and mortification of the limb, together with the greater difficulty which may attend the ligature, from condensation of the textures, in the event of its subsequently proving necessary. It is only the femoral artery which can be subjected to the method in question; and if this vessel be tied with proper care, there appears to be little or no danger from the operation. I have performed it thirty-three times without any bad consequences. On the whole, it would seem that the ligature is the quickest, easiest, most certain, and least painful means of remedy, while compression affords a useful substitute when circumstances prevent the operation from being performed with due attention to the circumstances requisite for its safety.

The advantages of Hunter's operation were so great and manifest in the situations for which it was proposed, that the old procedure being thrown completely into the shade, the new one came to be regarded as preferable for the treatment of all aneurisms except those of recent traumatic origin. But there seems reason to think that a serious error was committed in this general adoption of one method to the exclusion of the other, since the grounds of preference are not the same in all situations, and are indeed in some of them completely reversed, as when the axillary artery is the seat of aneurism. There is here every facility for performing the old operation, and great difficulty, as well as danger, in carrying the Hunterian method into effect. But while this cannot be denied, it has been maintained that the difficulty of execution is greatly counterbalanced by the safety derived from tying the artery at a sound part, instead of doing so at the seat of rupture. Indeed, it has generally been believed that the whole extent of vessel comprehended by the aneurismal sac should be regarded as unfit for bearing a ligature, although an unprejudiced view of the subject could hardly have failed to show that there was no sufficient foundation for this opinion, since the tumor is always small at its commencement, and the enlargement of the sac does not affect the artery concerned in regard to the soundness of its coats. It may be remarked further, that if the vessel is considered sound while beyond the confines of the aneurism, it should not be looked upon as diseased merely because the increasing size of the cavity

has led to its envelopment. Another objection to the old operation is the fear that opening a large sac would be attended with such profuse and protracted suppuration as might exhaust the patient's strength. But this apprehension can have no good ground, since the condensed texture which incloses the blood of an aneurism has no tendency to maintain a discharge after being relieved from the cause of distention. Lastly, it has been feared that laying open a large tumor of the kind in question might give rise to fatal hemorrhage, but, as will be explained hereafter, any such danger may be avoided through the use of means which have been devised for the purpose.

Treatment of Particular Aneurisms.

Popliteal.—One of the most common situations of aneurism is the popliteal artery, which, being subject to sudden extremes of tension and relaxation more than any other part of the arterial system, must be exposed not only to the directly exciting causes of the disease, but also to the predisposing effect of the same circumstances leading to morbid alteration of its coats. The tumor occupies the popliteal cavity, which it gradually fills, but hardly extends beyond so long as any part of the artery remains entire. A circumscribed pulsating swelling is felt in the ham, which weakens the limb, and usually occasions constantly increasing pain, as well as œdema, by pressing on the nerve and vein that lie over it. In some cases so little inconvenience is felt, that the disease escapes observation until it attains a large size. When the external coat gives way, so as to let the blood escape into the cellular texture, and convert the true aneurism into a false one, the swelling suddenly extends in all directions. The limb then becomes entirely useless, excessively painful, and œdematous—the pressure of the tumor induces absorption of the condyles of the femur—and if the disease is left to itself, the aneurism either opens and gives rise to a fatal hemorrhage, or undergoes a natural cure by coagulation and absorption of its contents.

It was here that the old operation proved most difficult and appalling; and when we consider the deep situation of the artery, the diseased condition of its coats, and their close connection to the bone through means of the tendinous sheath of the triceps; also

the large and shapeless cavity, at the bottom of which the vessel was to be secured; the hardly repressible hemorrhage; and the obstacle occasioned by the vein and nerve lying over the tumor, it does not seem surprising that its results should have been almost uniformly fatal. Dr. Wilmer of Coventry states, that at the time he wrote (1780), there was not an instance of its successful performance in this country. The modern operation could hardly have been more practicable for aneurism in this situation, if it had not been for the happy improvement of John Hunter (1785), who, observing that no large branch rose from the artery for a long way above the tumor, proposed to tie it on the fore part of the thigh, where it was nearer the surface, and at a greater distance from the disease; where the operation would be easier, and the coats of the vessel might be expected to remain in a more healthy state.

The artery may be tied either before or after it passes under the *Sartorius* muscle, but more conveniently at the former of these points, being there nearer the surface and further from the disease.

The patient being placed in a reclining posture, with his knee bent and the thigh placed on its outer side, the surgeon should feel with the fingers of his left hand for the triangular hollow which is formed by the meeting of the *Sartorius* and *adductor longus*, then stretching the integuments not transversely, but in the long direction of the limb, he should make an incision from two and a half to three and a half inches long, according to the thickness of the parts, having its lower extremity situated over the angle of union of the two muscles above mentioned, and running upward at a nearly equal distance from their respective edges. Separating the lips of the wound, he should expose and divide the fascia, after which, making an assistant hold aside the edge of the sartorius, he will expose the sheath of the vessels, and, lifting it up with the dissecting forceps, open it sufficiently to let the coats of the artery be seen distinctly. It is here that the principal nicety of the operation lies, since too much exposure of the vessel, especially by tearing, or the use of blunt instruments, incurs the risk of secondary hemorrhage; while if the arterial coat be not sufficiently denuded, there is no less danger of injuring the vein in the passage of the needle. The artery

should be exposed by means of the dissecting forceps and knife, just as in a careful dissection on the dead body. The opening in the sheath need not exceed three-eighths of an inch in length; but the cellular or fatty substance immediately enveloping the vessel in variable quantity must be raised in successive portions, and divided, until the surface of the artery appears perfectly white and distinct.

The aneurism-needle, previously threaded, is then to be passed round the artery, which will be easily effected if it has been adequately exposed, and the edge of the opening in the sheath is held aside with forceps to let the point of the instrument enter and escape. In doing this it is necessary to avoid the vein which lies below, and the nerve that runs on the outer or fibular side of the artery. On one occasion in the living body, and in another in the dead, I found a large vein, nearly half the size of the femoral, lying anterior to the artery. So soon as the ligature appears, it must be disengaged from the eye of the needle by the forceps or a hook, and pulled out of the wound while the instrument is withdrawn in the opposite direction. The operator having then satisfied himself that the artery and nothing more is included, should tie the ligature tightly in what sailors call the reef-knot, which is done by crossing the ends of the thread first one way and then the other. After the ligature is tied, one of the ends may be either cut away, or allowed to remain. The needle, though introduced carefully and properly, sometimes occasions a pretty copious flow of blood, which fills the wound almost as rapidly as it is wiped out, but ceases upon the ligature being tied, and probably depends upon the injury of a small branch happening to come off at the part. The edges of the wound should be brought together with a couple of stitches, and lightly dressed.

After this operation, there is a greater difficulty to be encountered, in the establishment of an adequate channel for the blood by the anastomosing branches, than occurs in most other cases, as the perforating and external circumflex branches of the profunda pour their contents into those of the articular arteries, and these rising from the popliteal portion of the vessel, which becomes obstructed by the coagulation that follows the operation, must transmit the blood into other branches communicating lower

down with the unimpeded arteries of the leg. The limb, therefore, should be protected from cold, and also from any sort of excitement.

If it is wished to tie the femoral artery below the crossing of the sartorius, an incision should be made in the middle of the thigh, commencing about three inches lower than where that for the former operation terminates. The external or fibular edge of the sartorius being exposed, should be drawn inward, when a strong tendinous fascia passing from the *vastus externus* to the triceps will be brought into view; and when it has been divided, the sheath will appear, containing the artery and vein, in the same relative situation as they were at the other part of their course. The operation should then be completed as already described.

Though the ligature of the femoral artery is not attended with much difficulty, it is frequently followed by bad consequences. It has long been my conviction that these depend upon the operation being considered too easy, and therefore conducted without sufficient attention being paid to the circumstances above mentioned, in regard to exposing the artery and avoiding the vein. In my own practice, as already stated, I have had occasion to tie the femoral artery thirty-three times, and never experienced any troublesome effects from the operation.

Ligature of the Arteries below the Knee.

Aneurism hardly ever occurs below the knee from internal causes; but wounds not unfrequently occasion hemorrhage, which requires the arteries concerned to be tied. In such cases, it is necessary to secure the injured vessel not only above the aperture, but also below it, since the anastomosing branches would otherwise maintain the bleeding.

The posterior tibial may be exposed by making an incision along the inner margin of the tibia, commencing opposite to the insertion of the sartorius, and running three or four inches downward. The knee being bent, and the foot extended in order to relax the gastrocnemius, the origin of the soleus from the tibia should be brought into view and divided, when the operator may pass his finger down to the artery, which lies somewhat more

than a finger's breadth from the edge of the tibia, immediately under the fascia that covers the deep-seated muscles, and then apply ligatures. But in operating for a wound of the vessel, it is always better to enlarge the existing incision than to make a new one. The artery might, if necessary, be tied very easily at the ankle. An incision about a couple of inches long should be made between the inner ankle and *tendo Achilles*, rather nearer the former than the latter; two layers of fascia, which are the continuations of the superficial one lying immediately under the integuments, and the deep one that covers the blood-vessels, nerves, and deep-seated muscles, with more or less intermediate cellular substance and fat, must next be divided, and then the artery is found lying with its two *venæ comites* on the tibial side of the nerve. The plantar arteries are sometimes cut, and would be tied with great difficulty, owing to the cellular and fatty textures which cover them being so thick and dense, especially when infiltrated with blood; but it is fortunately unnecessary to secure them in this way, as pressure properly applied is always sufficient for the purpose. The lint ought to rest directly upon the orifice of the bleeding vessel, and therefore, as has already been remarked, the wound should be dilated, if not wide enough to admit of its introduction.

The anterior tibial artery is liable to wounds at various parts of its course, and may be tied throughout almost the whole of it. This is not required below the ankle, as pressure is equally efficient, and much more convenient; but it may be necessary to apply ligatures higher than this. The vessel is not apt to be wounded further up than the middle of the leg, where the thickness of the muscles protects it. As it runs close to the interosseous ligament, and along the fibular side of the *tibialis anticus*, it may be always easily found by making an incision about two inches and a half long, at such a distance from the outer margin of the tibia as will allow room for this muscle, and then cutting down in the first muscular interstice.

The peroneal artery is so securely defended by the various parts which surround it on all sides, that it can hardly be injured without a very serious wound of the leg; and in the rare case of its hemorrhage requiring particular attention, instead of performing a very severe operation to apply the ligature, it would prob-

ably be better to enlarge the wound, if necessary, introduce graduated compresses, and support the limb with a bandage applied from the toes upward.

Femoral, Inguinal, and Iliac Aneurism.

Aneurism of the femoral artery sometimes occurs just before it passes through the sheath of the triceps, in which case the vessel ought to be tied above the crossing of the sartorius, as has been described for popliteal aneurism; or if the aneurism is the result of a recent punctured wound, the old operation may be performed; as there will be no reason to deem the arterial coats unsound, and the vessel lies favorably for the purpose. A tourniquet having been applied, the cavity is to be laid open, the fluid and coagulable blood sponged out, and the orifice being detected, two ligatures must be tied, one above and the other below the injured part. But if the case is of some standing, it will be better to perform the ordinary operation. I did so on one occasion with perfect success.

The disease not unfrequently appears at the groin, being seated in the common femoral artery above its bifurcation,—and then constitutes a tumor, which fills more or less completely the triangular hollow that exists at this part of the thigh, and is apt to be mistaken for a chronic abscess.

The proper remedy is ligature of the external iliac; and Mr. Abernethy had the merit of executing this bold attempt for the first time (1804), having previously tied the artery in another case on account of hemorrhage (1796). Both the patients who were the subjects of these operations died; but his next case (1806) was more fortunate. Mr. Freer of Birmingham, much about the same time, but rather earlier, met with complete success. Since then, the ligature of the external iliac has been practiced so frequently and successfully that it is now regarded as an ordinary proceeding.

The operation consists in making an opening through the abdominal parietes above Poupart's ligament, pushing aside the peritoneum, and then tying the artery, which is thus brought into view, or at all events within reach of the aneurism-needle. The incision for this purpose ought to run nearly parallel with

Poupart's ligament, but slightly diverging from it in proceeding upward, so as to be about the distance of an inch from the superior spinous process. It should be between three and four inches long, and placed lower down or further up, according to the situation of the tumor, so as to let the ligature be applied at some distance from the sac. Generally speaking, the lower end of the incision ought to be about half an inch above the middle of Poupart's ligament. The surgeon may cut through the integuments and tendon of the external oblique, as it is usually called, without any ceremony; but in dividing the internal oblique and transverse muscles, he should use the precaution of raising their fibers with the forceps, before cutting them; and having thus exposed a portion of the *fascia transversalis*, he may readily dilate to what further extent seems necessary, by means of a probe-pointed curved bistoury, guarded with his fore-finger. Gently scratching through this fascia, which, near the crest of the ilium, does not adhere intimately to the peritoneum, he will be able to push that membrane inward, and introduce his finger down to the artery which runs along the inner side of the *psoas magnus*, loosely connected with the vein. If the aneurism-needle is assisted by the counter pressure of a finger placed opposite its point, hardly any dissection will be required for detaching the vessel, and if the convexity of the instrument is turned toward the peritoneum, the risk of wounding it or the vein will be diminished; but in this particular the surgeon must be guided by his own convenience. If any considerable branch of the *circumflexa ilii* is cut during the operation, it ought to be secured. The edges of the wound should be stitched together, and lightly dressed. Sir A. Cooper recommended another mode of operating, which was certainly in some respects easier, but objectionable on several grounds, particularly in so far as it exposed the vessel too low down, in the neighborhood of the disease, the lymphatic glands, and the origins of the epigastric and circumflex arteries. This method was, to make a curved incision, having its convexity downward, and nearly in the direction of Poupart's ligament, beginning over the margin of the external inguinal aperture, and terminating near the spinous process, then to cut through the tendon of the external oblique muscle so as to expose the spermatic cord, which being pushed upward, along with the muscles

lying over it and the peritoneum under it, afforded room for applying the ligature.

The Internal Iliac has, on one or two rare occasions, been tied on account of aneurisms of the glutæal and ischiatic arteries affecting these vessels after issuing from the sacro-ischiatic notch. The operation is to be performed in the same way as that for the ligature of the external iliac, the incision being merely carried further upward, and made somewhat longer. The external iliac will form a good guide to the internal, which separates from the other at the sacro-iliac synchondrosis. The ureter crosses the vessel at this part, and might, through want of caution, be included in the ligature.

The Common Iliac can require to be tied only on account of wounds or aneurisms extending up the external iliac. Wounds of the common iliac, from balls or thrusts of sharp-pointed weapons, granting that they were not attended with any other fatal injury, would very seldom afford the time and opportunity necessary for applying a ligature, owing to their profuse hemorrhage; and where the aneurismal sac extends up into the pelvis, it generally adheres so intimately to the peritoneum as must render the ligature of the common iliac, without injuring this membrane, all but impossible. Dr. Mott of New York, nevertheless, succeeded in tying the vessel successfully. The aneurism reached far into the pelvis, but he managed to separate the peritoneum from its sac, so as to expose the artery and pass a ligature round it. He made an incision about six inches long, extending higher up than the one requisite for tying the internal iliac artery, and found great assistance from thin wooden spatulas, which were employed to hold aside the peritoneum with the intestines.

The aorta is occasionally found, on dissection of dead bodies, to be very narrow, or altogether impervious, either in consequence of original malformation, or owing to the complete spontaneous coagulation of large aneurisms in its course. In these cases the blood seems to be conveyed to the parts below the obstruction, chiefly by means of the anastomoses between the lumbar arteries and those of the intestines. If, therefore, the aorta could be tied without the infliction of a mortal wound, there is reason to believe that a cure might thus be accomplished in aneurisms ascending too high for being remedied by ligature of the

iliac. In dogs and other animals having long and thin loins, it is not difficult to tie the artery, by making a longitudinal incision between the lumbar and abdominal muscles and turning aside the peritoneum. In the human subject, there is not room enough for proceeding in this way, and the only practicable method seems to be that first adopted by Sir A. Cooper, as a forlorn hope in a case where the patient was reduced to the very point of death by hemorrhage from an iliac aneurism. He cut through the parietes of the abdomen in the *linea alba*, turned aside the intestines, cut through the peritoneum again, and tied the vessel. This operation may be performed without much difficulty, but it does not seem probable that the complicated dangers attending the double wound of the peritoneum, the handling of the intestines, and the shock caused to the system by suddenly impeding the circulation of the great arterial trunk, would leave the patient any chance of recovery. Sir A. Cooper's patient lived thirty-eight hours, and the circulation of the sound limb returned. His death was ascribed to its not doing so in the affected one, which was probably owing to the great extent of the aneurism obstructing a long tract of the artery and its branches, and consequently requiring the blood to be transmitted through many successive anastomoses.

If the aneurism ascends too high for ligature of the common iliac, instead of resorting to the desperate expedient of tying the aorta, it would be better to lay open the sac and secure the arterial orifice, which will probably be found considerably lower than the confines of the cavity. In a case where the tumor reached to the bifurcation of the aorta, I adopted this plan, and tied the external iliac just below its origin from the common trunk, the hemorrhage being completely suppressed by a clamp with which Professor Lister of Glasgow supplied me for the purpose.

Ligature of the Arteries of the Superior Extremity.

Aneurism seldom if ever occurs below the axilla, except as a consequence of wounds, and then, of course, has its sac formed entirely by the cellular substance exterior to the vessel. This used to happen most frequently at the bend of the arm when bleeding was in fashion, owing to the lancet being used incautiously, so as either to transfix the median basilic vein and punc-

ture the humeral artery which lies under it, or to open the radial or ulnar arteries instead of veins, which, when coming off high and running superficially, they very much resemble. If either of these disagreeable accidents were to occur, strong pressure should be exercised over the wound—a bandage being applied tightly from the fingers upward to support the arm in bearing it. If one of the smaller arteries is concerned, this treatment will probably prevent the formation of an aneurism, and if the trunk of the humeral itself is wounded, though the chance of its doing so will be much less, there is still room for hope. Even after an aneurism has formed in this situation, the treatment by rest and pressure of the whole limb sometimes effects the cure, and therefore a trial should be made of these means. If they fail, it then becomes necessary to resort to the ligature, and it ought always to be applied, here as elsewhere, in the case of a wounded artery, to the vessel actually injured, and not to the trunk from which it proceeds. The best way of proceeding is to lay the sac fairly open—to evacuate its contents—and then to apply a couple of ligatures, one above and the other below the opening.

Should it ever be thought necessary to tie the humeral above the elbow, the operation may be performed by making an incision two inches and a half in length along the inner edge of the biceps muscle. The artery will be found lying on the radial side of the median nerve, strictly connected with its *venæ comites*, and covered by the humeral vein.

When the arteries of the fore-arm happen to be wounded, they ought to be tied at the injured part. The radial is found in the first muscular interspace next the radius, and the ulnar in the first muscular interspace next the ulna.

Wounds of the hands and wrists are frequently attended with profuse hemorrhage, for which the humeral artery is sometimes tied. But the fact of this operation checking the bleeding proves that the case did not require it, since, if the hemorrhagic tendency were strong, it could not be subdued by a ligature so far distant from the wound, and with so many branches intervening. In all these cases, pressure, if properly applied, will be found perfectly sufficient for the purpose.

Axillary Aneurism.

Next to the ham and groin, the axilla is the most common seat of spontaneous external aneurism. It generally begins in the form of a small circumscribed tumor, formed by the external coat of the artery, and after increasing for a time gradually, suddenly enlarges upon rupture of the sac. It then not only fills the axillary cavity, but projects beyond it.

The first attempt to cure the disease in this situation by operation was made by Pelletan (1786), who proposed to divide the clavicular origin of the *Pectoralis major*, and thus expose the subclavian artery where it passes out below the clavicle. His colleagues withheld their consent, and would sanction only a dive with the needle after the integuments were divided. This ineffective and dangerous attempt was tried, and of course proved unsuccessful. Mr. Keate afterward succeeded, by executing the proposal of Pelletan (1800), so far as regarded the division of the pectoral muscle, but he also then plunged his needle in search of the artery. Mr. Chamberlayne operated more properly (1815), by dividing the muscle and then dissecting down to the vessel.

This operation is difficult, owing to the depth of parts—the troublesome hemorrhage proceeding from branches of the *thoracica humeraria* that lie in the way—the subclavian vein overlapping the artery—and the close proximity of the large nerves going to form the axillary plexus, which are apt to impose upon the surgeon and be mistaken for the artery. It is also seldom admissible, owing to the height to which the disease generally extends upward. The best mode of performing it would be to make an incision along the lower margin of the clavicle, from the coracoid process to near the sternum, and then another about the same length, proceeding downward from the acromial extremity of the former, in the direction of the space between the deltoid and pectoral muscles. The clavicular origin of the latter being then divided, and any arterial branch that bleeds considerably having been tied, the surgeon dissecting down on the acromial side of the plexus and nerves, in order to avoid the vein, will find the artery, and be able to include it in the ligature.

The subclavian artery can be much more easily and advanta-

geously tied above the clavicle, immediately after it passes out behind the *scalenus anticus*, where it is more superficial, detached from the vein, and at a greater distance from the disease. Mr. Ramsden had the merit of first performing the operation here (1808); and, though the case terminated unfavorably, it led to others, which have established this as the best mode of proceeding for the purpose. Dr. Post of New York met with the first instance of success (1817).

The method of operating described by Mr. Ramsden has hardly been improved. The patient being placed on his back with the head rather lower than the trunk, and his shoulder having been depressed as much as possible, an incision should be made, along the upper edge of the clavicle, from the insertion of the sterno-mastoid to that of the trapezius. Another cut, perpendicular to the former, and of about the same length, ought next to be carried from its center upward, parallel with the external edge of the sterno-mastoid. The flaps thus formed should be reflected with the *platysma myoides* and fat—the jugular vein being, if possible, avoided or held aside; and then the surgeon dissecting down to the lower edge of the inferior belly of the *omo-hyoideus*, exposes the *scalenus anticus*, taking care not to cut the supra-scapular artery, which must be tied if wounded. Tracing this muscle to its insertion into the first rib, he is led infallibly to the artery, which passes out behind it immediately above its attachment. He then either carries the needle round the vessel where thus exposed, or, in case of its showing any sign of morbid alteration, uncovers it a little further, by cutting or turning back the edge of the scalenus—in doing which there is no danger of injuring the phrenic nerve, as it lies here quite at the sternal edge of the muscle, having crossed it obliquely in descending from the cervical plexus. It appears from the cases on record, that the large nerves going to constitute the axillary plexus, though not lying in the way of the artery, are apt from their proximity to be mistaken for it; wherefore the surgeon should be cautious in passing the ligature, and not tie it until satisfied, by the effect of compressing what he has included, that it is really the artery.

Notwithstanding the superiority of this proceeding over those which were previously employed for ligature of the subclavian

artery, there can be no doubt that the operation is not merely very difficult, but also very dangerous, since it has been found, in the recorded cases of its performance, that fully a half of the results were fatal from secondary hemorrhage, deep-seated suppuration, and other bad effects. It would therefore seem better in this situation to prefer the old operation, for which the vessel is very conveniently situated, since, if not found to admit of being tied within the confines of the sac, it may be exposed quite up to the clavicle by dividing the superjacent muscles. That this artery may be safely tied at the seat of rupture, is proved by the facts that I have with perfect success twice amputated at the shoulder-joint for axillary aneurism which did not admit of any other remedy, and twice operated by laying open the sac; while the hemorrhage may be completely prevented by making an incision at the outer edge of the sterno-mastoid, so as to admit the finger of an assistant, and allow it to press upon the vessel when it rests on the first rib.

Carotid Aneurism.

The carotid artery at the angle of the jaw, where it divides into its two great branches, occasionally becomes the seat of aneurism, which is easily recognized by the general characters. Sir A. Cooper first ventured to tie the common carotid for this disease (1805); and though the attempt did not succeed, he repeated it successfully not long afterward (1808). Since then the artery has been secured very frequently, on various accounts, and with so little difficulty or bad consequences, that the operation is regarded as one of ordinary interest.

The patient should be placed on his back with the head low—or at all events on a level with the trunk. The external incision should be two inches and a half long, or more if the patient's neck is thick. It should extend along the internal or sternal edge of the sterno-mastoid, and be more or less distant from the sternum, according to the part of the vessel which it is wished to tie. The artery lies most superficially in the higher part of the neck, where it is covered merely by the integuments, *platysma myoides*, and fascia. Lower down it is overlapped by the sterno-mastoid and sterno-thyroid muscles, and is crossed by the omo-

hyoid.. The upper part of its course, therefore, would be preferable for the purpose; but as the disease or injury which requires the ligature is generally seated here, the surgeon has seldom any choice, and must in general operate at or below the crossing of the omo-hyoid. The edge of the sterno-mastoid having been brought into view, should be held aside so as to expose the ascending belly of the omo-hyoid, which in its turn being turned either up or down, accordingly as it is desired to tie the vessel above or below it, of which plans the latter is usually preferable, the sheath of the vessel will present itself. It ought to be opened on the tracheal side, to avoid the *descendens noni*, which runs down the center, and, what is of more consequence, to prevent any risk of injuring the internal jugular vein, which lies on the outer side and overlaps the artery. The *par vagum* being situated behind the vessels, is hardly in the way of harm. The convexity of the needle ought to be turned toward the vein.

In a case of traumatic carotid aneurism at the lower part of the neck, which extended to the sternum, and therefore precluded the possibility of applying a ligature below the tumor, I punctured the sac so as to admit my finger, and having thus detected the arterial orifice, closed it by pressure while I laid the cavity freely open, sponged out its contents, and tied the vessel above as well as below the aperture. The result was completely successful, and saved not only the patient's life, but also that of his assailant who inflicted the wound.

The bold operation of tying the *arteria innominata* was first performed by Dr. Mott (1818), on account of subclavian aneurism. The ligature separated on the fourteenth day, and everything seemed to be going on favorably, when a week afterward, bleeding commenced from the wound, and recurred from time to time, until the patient's strength was completely exhausted, which happened on the twenty-sixth day after the operation. Graefe tied the artery (1822) with a similar result. The ligature separated, and the patient seemed to be safe, but died at the end of two months from hemorrhage. It thus appears that when a ligature is applied so very near the heart, the danger of bleeding continues longer than in other situations, owing probably to the great force of the blood which issues directly from the heart tending to break through the weak and recently-formed obstruc-

tion. Perhaps the danger might be diminished by weakening the action of the patient's system by depletion and abstinence for some time after the ligature is detached.

The operation, though important and dangerous, is not very difficult. Two incisions should be made of nearly equal length, which may be about two inches—one upward from the sternum along the inner edge of the sterno-mastoid, and the other transversely, from the same point across the sternal attachment of this muscle. The flap of skin thus formed being reflected, the sternal attachments of the sterno-mastoid, sterno-hyoid, and sterno-thyroid muscles, must be divided to a sufficient extent for bringing into view the sheath of the vessels, which ought to be opened as if for the ligature of the carotid. This vessel having been exposed, if traced down, will lead to the innominata, round which the needle should be passed very carefully, in order to avoid the pleura and great venous trunk.

The Temporal artery, from its exposed situation, is liable to be wounded. I have twice met with a small circumscribed aneurism of this vessel, originating from external violence without the infliction of a wound. In such a case, the best mode of procedure is to make an incision through the skin, and dissect or pull out the sac completely, so as to leave merely the orifices of the vessel, which may then be tied as usual. Hemorrhage from wounds, whether intentionally or accidentally inflicted, may in general be suppressed by carefully-employed pressure — a piece of cork wrapped in lint being applied over the part, and secured firmly it its place by a narrow roller, carried round the head and crossed repeatedly over the compress; but if the bleeding has not been effectually restrained at first, it becomes more obstinate from its continuance, by distending the cellular substance and impeding the effect of external pressure. In these circumstances, there should be no hesitation in cutting through the seat of the injury in the direction of the vessel, separating the integuments a little on each side, and then passing a ligature under the artery by means of a sharp needle, first on one and then on the other side of the breach.

Aneurism by Anastomosis.

Mr. John Bell described, under the title of Aneurism by Anastomosis, a subcutaneous tumor, which possessed a flattened shape, a doughy consistence, and a cellular structure, communicating very freely with the branches of neighboring arteries, so that it pulsated or throbbed obscurely, and bled profusely when opened by incision, though when the morbid structure was cut entirely out there was not any more hemorrhage than might have been expected from the vessels of the part. Mr. Bell regarded this formation as composed of cells with which the veins and arteries freely communicated, and into which the blood was induced to flow with extraordinary force. The tendency of aneurism by anastomosis being to enlarge, open, and bleed, Mr. Bell recommended complete and speedy excision as the only and essential remedy.

More recent and extended observation has not only thrown light upon the nature of this tumor, but also proved that there are others of an analogous kind which should be arranged along with it; and the term of Morbid Erectile Tissue has been employed as the general title for this purpose. Every part of the capillary system probably has the power of inducing blood to enter it, and those portions of the body which, being distinguished by a remarkable degree of this property, are said to be formed by erectile tissue, as the penis, nipple, or wattles of the turkey-cock, in all probability exercise a similar power in a similar manner, but only on a greater scale, proportioned to the development of their structure. Instead, therefore, of being constituted by distinct cells interposed between the veins and arteries, they consist merely of the capillary vessels dilated. In some animals the natural erectile tissue is evidently formed in this way, as, for instance, the glans penis of the ram and fallow-deer; and there are a few cases recorded in which the morbid erectile tissue was no less distinctly composed of dilated and convoluted vessels.

Under the head of Morbid Erectile Tissue may be ranged—Aneurism by anastomosis, and Nævus.

Aneurism by anastomosis is almost always seated in the texture lying under the skin, which is more or less elevated, and

in general slightly discolored, having a blue or purple shade observable in it. The swelling throbs synchronously with the heart, becomes smaller when compressed, and more turgid when the circulation through the arteries is excited, or that through the veins impeded. At birth it is usually small, frequently hardly perceptible, and sometimes does not enlarge until puberty. After becoming active it generally increases in size, at length opening, bleeds from time to time. Its most common situations are the head, neck, hands, and feet. The best remedy for this disease is excision: and in performing the operation, it is proper to cut quickly and completely beyond the morbid structure. The ligature also may be employed, care being taken to embrace the whole extent of the disease—since a troublesome or even fatal hemorrhage may otherwise result. The arteries leading to the diseased part becoming much enlarged and tortuous, have repeatedly suggested the trial of attempting to afford relief by tying them, but in no case with success. Ligature of the arterial trunks, as the carotid in aneurism by anastomosis of the face or scalp, has also, for the most part, proved unavailing, though in some instances the result proved more satisfactory. The carotid artery has been tied with success in various cases of swelling in the orbit which seemed to be of this nature; but as they were not of congenital origin, they must be regarded as questionable exceptions from the general rule.

Nævus is an enlargement of the venous capillaries, which may be confined to the surface of the cutis or affect the subcutaneous texture. There is little swelling, but very obvious discoloration, generally of a red or purple hue. There is no pulsation, but turgescence when the circulation is disturbed, especially by any circumstances which obstruct the passage of the veins. The disease is most frequent in the head and trunk, but also appears on the extremities. It is always congenital; and when first observed is usually of very small extent, being merely a point or speck, which increases rapidly after birth. After attaining a certain size, it generally either remains stationary, disappears by absorption, or ulcerates and scabs away by degrees.

The treatment ought to vary according to circumstances. If the nævus is stationary, and not inconvenient, it ought not to be meddled with. If increasing, or so situated as to occasion de-

formity, it ought to be cut out or removed by ligature—two or more threads being passed under its base, as will be more particularly explained immediately, and tied tightly, so as to effect complete strangulation. The application of pressure and astringent washes, and also local irritation, such as that produced by vaccination, in order to cause absorption or the ulcerating and the scabbing process, are not only very uncertain and ineffectual, but apt to leave unseemly marks, hardly less objectionable than that for the removal of which they are employed. When the nævus is small and superficial, it may be removed by punctures with a pin dipped in nitric acid.

The subcutaneous nævus exists either alone, or, more generally, along with the superficial nævus; like which, it seems to depend more upon the veins than the arteries. It occurs in the same parts of the body, and is always congenital. At the time of birth it occasionally has attained a large size, and soon afterward begins to bleed profusely. But much more frequently it increases slowly from a very small commencement, and may not prove troublesome until a pretty advanced period of life. It is recognized by its bulk and extension under the skin, together with the negative character of wanting pulsation. Like the superficial nævus, it occasionally shrinks or ulcerates away.

When this tumor is seated on the face, is rapidly increasing, or threatens to bleed, it ought to be removed without delay; and though excision may, in some cases, be practiced with advantage, as when the base is small, so that the wound required admits of healing by the first intention, in general, or rather nearly always, the ligature affords the most eligible means of removal. If the disease can be completely embraced in two ligatures, nothing more is necessary than to pass a needle carrying a double thread from one side of the base to the other, and then tie the two halves as tightly as possible. It frequently happens, from the extent or form of the nævus, that four ligatures are required, and then two needles should be employed,—one being passed through the base, but not carried further, until the other conveys its thread fairly through, by which means any risk of cutting the ligatures by the sharp edge of the second needle is avoided. In this case the tying of the threads, though facilitated by the morbid surface being divided into smaller por-

tions for inclusion, is rendered complicated and troublesome by their numbers, as well as the circumstance that any two cannot be rendered secure until they are tied on both sides, whence it is necessary that, while one of the knots is made, the other ends of the threads must be either held or tied at the same time by an assistant. The ligatures should be tied in what is called the surgeon's knot—that is, by having the ends crossed twice, which prevents slipping until the fastening is made good. If still more ligatures are required, they must be introduced and secured on the same principle. Thus in a case of large pendulous nævus occupying nearly the whole of one side of the face, I employed upwards of twenty. On such occasions, the best way of proceeding is to pass successive portions of a long thread again and again, by means of a needle with an eye in its point, and fixed in a handle.

Mr. Liston has recommended that, in applying ligatures for the removal of erectile tumors, the integuments covering them should be divided by a crucial incision, and reflected so as to let the diseased structure alone be removed, in order to hasten the process and save the sound skin.

In a case of this disease in an infant, where the tumor was large and bleeding, Mr. Wardrop, in order to save the life of the patient from immediate danger, tied the carotid artery; and with success. He was induced to follow this course by the unfortunate result of an attempt to cut out the nævus in a similar case, where the child died during the operation. It would probably be safer practice, in such circumstances, to apply ligatures.

Aneurismal Tumor of Bone.

Tumors originating from the osseous tissue, and presenting the characters of aneurism, are not unfrequently met with. For the most part they consist of a soft yielding substance, which diminishes in bulk under pressure, and possesses an expansive pulsation, in consequence of its vascular texture. The characters derived from this source vary extremely in degree, and are sometimes so distinctly marked as to simulate an aneurism beyond the possibility of diagnosis, except from its situation. In such cases there is of course no means of remedy unless through removal.

But it is believed, from the record of some apparently well-authenticated instances, that there may also be found in bone tumors of a more truly aneurismal nature, in which there is merely a cavity containing blood proceeding from the rupture of arterial branches, and, therefore, amenable to ligature of the trunk. While not prepared to deny the possibility of such a condition, I must regard it as extremely rare, having never met with a single example of its occurrence in the course of a long practice. The nearest approach to it which ever fell under my observation was that of a case related by Mr. Liston, where he removed a portion of the scapula for a tumor seeming to consist of blood contained in a cavity formed by the expanded periosteum; but even here the disease returned in an unequivocal form of cerebriform growth. If an Osteo-aneurism, as it has been called, were really to occur, and admitted of distinct recognition, ligature of the arterial trunk would be worthy of a trial.

VEINS.

Inflammation of Veins.

The veins are more numerous and capacious than the arteries, whence the blood moves through them more slowly and less forcibly. The veins not only communicate by capillary anastomosis of their neighboring branches, but are frequently united in their course; and hence occasion less inconvenience by their obstruction than that of the arteries does. When the principal trunk of a limb is concerned, the resistance which is opposed to the return of the blood causes more or less swelling. The coats of the veins resemble those of the arteries, but are thinner, more closely connected, and tougher, so that a ligature merely draws them together without cutting the internal ones.

The veins are prone to inflammation, which is very much disposed to spread, and chiefly in the course of the circulation. The vein affected feels hard and painful, especially when extended. The surface of the skin which covers it is often red, from the adjacent tissues taking on the same action. The pain is of a peculiar, oppressive, sickening kind, similar to that which attends inflammation of the glands and absorbents. When these local

symptoms are at all acute, they are accompanied with more or less fever, which is distinguished by characters indicative of extreme irritation, whence it is usually named Irritative Fever. The pulse is quick and small; the respiration hurried and anxious; the countenance contracted and expressive of distress; the tongue dry and brown. There is great prostration of strength, and often, especially in the progress of the disorder, delirium. Acute inflammation of the veins, and more especially those of large size, almost always proves fatal. Death may ensue in a few days, but seldom before the end of a week. On dissection, the vein is found thickened in its coats, and containing coagulated blood, or pus, or a mixture of both. There are also very generally purulent effusions in the cavities of the chest, those of the joints, or in the subcutaneous cellular texture, together with deposits in the substance of the lungs very similar in appearance to tubercles. The explanation of these effects has not yet been well made out; but the opinion generally received at present is, that the pus suffers absorption into the mass of circulating fluid, and thus produces the effects in question. In proportion as the inflammation is chronic, the danger is small. The local effects are, in the first instance, redness and thickening of the vessel, then suppuration into the cavity, or the effusion of lymph, which, together with coagulation of the blood, just as happens in the arteries in similar circumstances, impedes the circulation and obliterates the channels affected. The veins are induced to take on the adhesive action by compression, and the other kinds of irritation which occasion it in the arteries, but they are much more readily excited by these means to inflame. The atheromatous and calcareous degenerations occur so rarely in their coats that they may almost be said never to affect them.

The causes which have most effect and are most frequently concerned in the production of inflammation in the veins, may be referred to: immoderate or long-continued distention, and the infliction of wounds which do not heal by the first intention.

John Hunter, who had the merit of directing attention to the causes and important consequences of venous inflammation, when they were almost entirely overlooked, observed that the veins running near parts which had suffered inflammation and suppuration took on a similar action, and effused pus or lymph, or both,

into their cavities. Succeeding inquiry has ascertained that this is not a constant, or even very common occurrence; and it is possible that he may have sometimes mistaken the effect for the cause, the abscesses in the cases he observed being perhaps the consequence of venous inflammation, and not the origin of it. Of all the causes which induce inflammation of veins, there is none more certain than the infliction of a wound which does not heal by the first intention. When the wound does not heal by the first intention, it must of course inflame; and the morbid action thus instituted is apt to follow its characteristic tendency to spread. John Hunter showed that many of the bad consequences of venesection, which used to be referred to pricks of the nerves or tendons, really depended on the wound not healing and the veins inflaming. It is of great consequence to notice that the tendency to venous inflammation varies with the state of the system; so that while very slight causes may prove sufficient to induce it, very severe ones may fail in doing so. Thus in crowded hospitals or other unhealthy situations, a large proportion of operations terminate fatally from inflammation of the veins; and wherever erysipelas abounds, phlebitis is apt to be associated with it.

With regard to the treatment, it must be admitted, that when the inflammation is acute and attended with much constitutional disturbance, it hardly yields to any remedy. In such cases, therefore, the prognosis should be very unfavorable. General bleeding seems to do no good; and, on the contrary, rather to increase the irritability of the system, which more requires calomel and opium. Local bleeding and fomentations are useful when the inflammation is acute. Warm solutions of acetate of lead with opium, and the *tinctura saponis cum opio* with camphorated mercurial ointment, and the pressure of a flannel bandage, constitute the best local applications when the affection is chronic.

Wounds of Veins.

When veins are cut across, their orifices are closed by the same process which effects the obstruction of arteries in similar circumstances; and the smaller moving force of their contents favors this occurrence on one side of the aperture, while the valves

still more effectually prevent any disturbance of the adhesive process at the other. If the vein concerned is one of the great trunks, and devoid of valves for preventing a retrograde motion of the blood, pressure ought to be preferred to ligature for restraining its hemorrhage, and a very slight resistance will be found sufficient. When veins are not divided, but merely wounded through a part of their circumference, they do not necessarily or usually either remain open or suffer complete obstruction, as the arteries do, but heal, and regain their original condition. This difference is owing to the smaller distention of the venous coats, which allows the effusion of lymph that takes place from their cut edges to become organized. If the lips of the wound continue *in situ*, they unite at once with each other; but if they are displaced, owing to their transverse direction, or any other cause, there is, in the first instance, injection of blood into the surrounding cellular substance; then the formation of a firm, round, smooth coagulum exterior to the wound; and, *lastly*, an exudation of lymph from the vessels of the vein, which, resting upon this clot, extends from one cut edge to the other, and gradually unites them together, after which, the clot being absorbed, the cure is completed.

Varix.

Varix consists in a dilatation and thickening of the veins, which become at the same time elongated, and thus constitute a tortuous swelling. It occasions deformity, weakness of the part concerned, by impeding the circulation, and uneasy sensations from the same cause. It also renders the vein liable to chronic inflammation, ulceration, and hemorrhage. The saphena, spermatic, and hemorrhoidal veins are most liable to the disease. It seldom appears in the limbs before maturity, but occurs in the other situations which have been mentioned at a much more early age. Tall stature and largeness of the veins predispose to the disease; constipation, pregnancy, hepatic derangement, and sedentary occupations favor its actual commencement.

The treatment of varix consists in obviating the exciting causes, for which purpose the bowels ought to be kept open, the testicle ought to be suspended, and the leg ought to be supported with a bandage or laced stocking. The horizontal posture ought

to be preferred and the erect one avoided. When the vein inflames, it ought to be treated according to the rules already explained; the symptoms are almost always subacute or chronic, and local remedies merely are required. When it bleeds, pressure must be applied. When ulceration occurs in connection with it, which most frequently happens in the case of varix of the saphena, and affects the inner side of the leg a little above the ankle, the surgeon should be guided in his practice by the indications of indolent or irritated action which the ulcer may exhibit. If there appears not to be any obstacle to the cure on either of these accounts, he may simply use the black wash and bandage, under which cicatrization is in general speedily accomplished.

In order to effect a radical cure of varix, it has been proposed to obliterate the vessel above the diseased part, so as to take off the dilating effect of a superincumbent column of blood, and this has been done in various ways. The ligature, which had been long before tried and rejected on account of the danger attending its use, was recommended by Sir Everard Home, and on his authority tried rather extensively, but with such troublesome and even fatal consequences as effectually prevented it from being employed in future. Sir B. Brodie revived a still older method—viz., obliterating the vein by incision. Instead of cutting out the varicose portion, which was the ancient practice, he merely divided the vessel, using a narrow knife, and making a small puncture of the skin. The consequences of this practice, though not so disastrous as those of the ligature, were still occasionally disagreeable enough to overbalance the chance of benefit. Another proposal was made by Mr. Mayo—viz., to make an eschar with caustic over the vein at a sound part of its course above the varix, and thus excite such inflammation of the vessel as might be sufficient to occasion obliteration of its cavity by the effusion of lymph. This method has the recommendation of being an imitation of a natural process of cure, for it sometimes happens that the varicose vessel, in consequence of spontaneous inflammation, becomes completely impervious. In exciting this action artificially, however, there is great difficulty in avoiding the opposite extremes of deficient and excessive irritation, and alarming inflammation has in consequence been repeatedly induced. M. Velpeau has more lately introduced a method of

great simplicity and perfect safety, which consists in passing a common pin through the skin, under the vein, while it is compressed and held outward by a finger and thumb, and then tying a thread tightly round it. A little redness and swelling follow, and ulceration soon succeeding detaches the pins with hardly any pain and no danger. It is still questionable, however, whether obstruction of the vein merely at a part of its course is adequate to afford permanent relief; and in the present state of information upon the subject, it seems that the most judicious course in treating varix is to be satisfied with remedying its bad consequences, and using means for preventing their occurrence.

Aneurismal Varix.

When a contiguous artery and vein are wounded together, it occasionally happens that the orifices of the vessels remaining undisturbed, the blood is allowed to pass from the artery into the vein; the consequence of which is, that the latter vessel becomes large and tortuous, communicating a jarring sort of sensation to the hand which examines it, and a peculiar thrilling sound, like the purring of a cat, or the prolonged articulation of the letter R (*bruit de râpe*), is heard when the ear is brought near the injured part. The limb becomes œdematous and cold, owing to the want of its usual supply of nutritious fluid, the greater part of which, instead of proceeding onward to its destination, flows back to the heart, and also to the obstacle opposed to the return of the blood from the veins below, by the distention of those above, which is caused by the forcible current of the artery. From the same cause there is hardly any pulsation of the artery below the part where it is wounded, while it pulsates above more forcibly than it did before.

Dr. Hunter first described this disease (1756), but Dr. Cleghorn of Dublin suggested the name which is used to denote it (1765). It is most apt to occur at the bend of the arm, where the median basilic vein lies over the humeral artery, but may do so in any part of the body where a large artery and vein are contiguous. Instances of it have been observed in the femoral, popliteal, carotid, and subclavian vessels, from wounds.

Aneurismal varix is generally more inconvenient than danger-

ous, the veins, after they become fully distended, usually remaining without any further change. It is, therefore, seldom necessary to do more than apply a bandage to the limb, with a compress over the injured part. Should the swelling, pain, or other symptoms of the case be so severe as to warrant an operation, a radical one may be performed by tying the wounded artery both above and below the opening.

Varicose Aneurism.

When, in the case of a vein and artery communicating, the blood issues from the latter vessel into the cellular substance, so as to constitute a false aneurism, and at the same time continues to gain access to the vein, a combination of aneurism and aneurismal varix results, which has been named Varicose Aneurism. More correctly, this condition would have the title of Aneurismal Varix, since its peculiarity is not in the aneurism, but in the complication of venous distention by the force of arterial blood. In 1831* I put upon record a remarkable case, in which an aneurism of the abdominal aorta communicated with the vena cava; and similar cases of spontaneous injury have since been observed. With few exceptions, the bend of the arm has been the seat of this occurrence, in consequence of wounds. Owing to the free passage which remains for the blood, and the absence of regurgitation or stagnation, there is little or no tendency to coagulation; and in operating here I have found the interior of the sac perfectly white and smooth, like the inner surface of an artery. No benefit, consequently, would be derived from the simple ligature of the humeral; and the proper course is to lay open the cavity and apply two ligatures to the vessel, one above and the other below the aperture. But so little inconvenience is usually experienced from the disease, that the better course in general is to abstain from interference.

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* Contributions to the Pathology and Practice of Surgery, p. 286.

CHAPTER IX.

EXTERNAL INJURIES.

Bruises.

By a Bruise is understood an injury caused by a blow, or violent compression, without division of the integuments. Its effects vary according to circumstances, but the one most common is Ecchymosis, or the injection of blood into the cellular tissue, which occasions more or less swelling, and discoloration of the skin. The blood, after being thus effused, is gradually removed by absorption, during which the color of the part passes through various shades of red, green, and yellow. To promote this absorption, some gently stimulating lotion, containing the salts of ammonia, spirits, and vinegar, ought to be applied, together with moderate pressure. It is usual to apply leeches in the treatment of ecchymosis, but as the blood is not contained within its own vessels, and, on the contrary, is extravasated into the cellular texture, bleeding from the surface cannot possibly be of any service, and may even do harm, by increasing the weakness which the skin has previously suffered, both from the immediate effect of the injury and also by its separation from the parts beneath through the bloody effusion, and thus causing sloughing.

The blood is sometimes effused in larger quantity, and collected in a cavity formed by the torn and distended cellular substance. In this kind of bruise there is usually the same sort of discoloration of the skin as in the former, but the size and fluctuation of the tumor readily distinguish it. This condition is comprehended under the title of ecchymosis; but it is necessary to make a distinction between the two, though doubtless merely different degrees of the same injury, since the process of recovery is apt to be considerably different.

It is always desirable to promote absorption, and for this purpose the same means as those employed to discuss superficial

ecchymosis are proper, especially lotions and pressure. Sometimes the serum continues little or not at all diminished, in which case blisters, succeeded by pressure, ought to be used, and if these means fail, the fluid may be drawn off by a trocar. The contents of these effusions are also apt to shift from one part of the body to another, according to the tendency of their weight.

When the effusion is large, or the parts about it have been much injured, or the patient is of an irritable habit, the parietes of the cavity are apt to inflame and convert it into an abscess. Any tendency to this ought to be allayed or prevented by cold applications; but, so soon as there is reason to believe that matter has actually been formed, free vent should be afforded to it and the remaining blood by an incision; after which pressure and some stimulating wash will promote contraction and closure of the cavity.

The appearance of ecchymosis so regularly attends the infliction of bruises, that much importance is frequently attached to its presence or absence in medico-legal investigations. The discoloration of the skin caused by it must be distinguished from the *livor*, which generally appears on the dependent parts of the body after life becomes extinct. This may be readily done by making an incision through the part in question, as the blood in ecchymosis will be found coagulated in the seat of its effusion, while in livor there is merely congestion of the cutis. The time required for ecchymosis showing itself is also an important point. The more superficial the effusion is, the more quickly will the discoloration appear—and according to the difference in this respect, three or four hours, or as many days, will be necessary. It should be recollected that the effusion and discoloration are two distinct things; that the former happens immediately after the injury, and may be certainly discovered by dissection; but that the latter, though, when present, affording evidence of violence having been sustained, does not prove by its absence that no effusion has taken place. Persons laboring under the disease named *Purpura hemorrhagica* have often discolored marks on the skin resembling those of ecchymosis. Blood may be effused into the cellular texture, in consequence of violence sustained soon *after* death—but in this case it proceeds from rupture of the larger vessels and is not coagulated. Finally, it is necessary

to notice, that the presence of a wound in a bruised part may prevent any discoloration by allowing the blood to escape.

Wounds.

By Wounds are understood solutions of continuity in the surface of the body effected by violence. They are divided according to the injury which the parts concerned sustain in addition to the wound, and also the form which it possesses, into Incised, Punctured, and Contused.

In incised wounds, there is merely a solution of continuity inflicted by a cutting instrument, without any other injury of the part concerned, and the superficial extent of the aperture bears a considerable proportion to its depth. The great object in treating such wounds is to induce union by the first intention, and the general observations which have been already made on that process suggest the practice to be followed with this view. All foreign matters should be removed from between the cut surfaces; blood and serum should be prevented from collecting, by avoiding close dressing; and the actions of the system should be kept within proper bounds by suitable diet, with perfect quiet of the part affected. Wherever pressure is sufficient to keep the cut edges in contact, it ought to be preferred for the purpose. Plasters are apt to approximate the lips of the wound merely, and, so far from pressing the deeper parts of the wound together, rather render them more separable by relaxing the superjacent integuments. The introduction of silver sutures for retaining the cut edges in contact, has with great advantage superseded all the other means which were previously employed with this view. They afford sufficient support without causing injurious pressure on the textures concerned, and, producing no irritation, may be allowed to remain until the process of reunion is so firmly completed as to render any further protection unnecessary.

When the superficial extent of a wound is very small in proportion to its depth, it is said to be punctured. Such wounds being caused by instruments which have small points and blunt edges, are not formidable in their appearance, but usually turn out much more troublesome than incisions of far greater size, by occasioning extensive inflammation and widely diffused suppura-

tion. These bad consequences of punctures are usually ascribed to their penetrating some texture, which inflames and gives rise to the effects in question; but it seems more reasonable to refer the diffused inflammation occasioned by them, to the confinement of the discharge which necessarily results from their narrow aperture, and the resistance of the fibrous expansions which have been injured.

The most effectual method of checking the inflammation which proceeds from punctures consists in dilating the orifice of the wound, and it is, therefore, often recommended to do this immediately after their infliction, to prevent bad consequences. It does not appear, however, that the chance of these is thus diminished; and, therefore, the most prudent course is, in the first instance, merely to apply cold water or other lotions proper for moderating action and preventing inflammation. Should it actually commence, dilatation ought to be performed without delay, and then fomentations with poultices are proper for a few days, or until the suppurative action is fully established, when compression and moist dressing must be substituted in their stead.

Contused wounds are solutions of continuity, in which the surfaces are injured by the violence that occasions them—the agent being usually some blunt surface, which strikes, or on which the body is impelled, with great force. Contused wounds in general bleed less than incised ones; their surface is ragged or lacerated: and sometimes of a dark color, owing to effusion of blood into the cellular substance. When the contusion is considerable, it renders the wound incapable of uniting by the first intention, and excites inflammation, which either terminates in mortification or leads to suppuration, according to the extent of the injury and the irritability of the patient. It was formerly the custom to cut away the contused and lacerated edges, to supersede the more tedious process of sloughing; but nature is now allowed to determine what portion is incapable of recovery. All foreign matters ought to be carefully removed from the wound, and its edges should then be placed as nearly as possible in contact. If there is no great degree of contusion, stitches may be employed for this purpose; but, generally speaking, it is better to abstain from them; and if they are used, any appearance of inflammation should be the signal for their removal. Cold appli-

cations are proper in the first instance, and ought to be continued until the wound either unites or inflames. In the latter case, warm fomentations and poultices are required; but they must be laid aside as soon as the sloughs have separated and the granulating action is established. If continued longer than this, they induce relaxation of the parts concerned, already weakened by the injury, render the granulations large and flabby, and prevent the sores from contracting. The resulting ulcer always tends to weakness of action, and therefore, instead of these enfeebling applications, requires lotions with pressure.

Gunshot wounds are solutions of continuity effected through the agency of substances impelled by fire-arms. They are generally punctured as to their form, and always contused as to their surface. They are consequently apt to occasion extensive inflammation, and sloughing of the parts more immediately concerned. The orifice by which a ball enters is small, round, depressed, and livid; that by which it escapes, larger, more elongated, and everted at its edges. These appearances vary with the velocity of the ball, the entrance being most, and the exit least distinctly characterized when it is greatest, and *vice versa*. The wound when first received occasions a numb sort of sensation, but before long becomes acutely painful. It bleeds less than an incised wound in the same situation would do. When of any considerable extent, it is apt to cause, immediately on its infliction, more or less mental alarm, despondency, and prostration of strength. This constitutional effect is proportioned to the importance of the injury, the weakness of the patient, and his apprehension of danger.

The bad consequences of gunshot wounds were formerly ascribed to a poisonous agency of the gunpowder; and upon this belief was founded the practice of scarifying or excising the wounded surfaces, and dressing them with scalding oils. Paré introduced a milder method, which he was led to, in the first instance, by necessity, and was afterward confirmed in by experience and reasoning on the subject. He used merely simple unctuous applications, and with such success, that his example was soon generally followed. The treatment of gunshot wounds, though so far improved, still continued unnecessarily severe, since the scarification, which was formerly practiced to remove the

poison, still remained in use, to prevent tension and inflammation from the fistulous shape of the wound. John Hunter exploded this system of dilatation, as it was called, by showing that it did not prevent the effects in question, and was performed soon enough if delayed until they actually appeared. The best application at first is a pledget of oiled lint, placed on the wound, and covered with cold wet cloths. Should inflammation supervene, free dilatation, including any fascia that has been wounded and lies within reach, with fomentations and poultices, become proper; when the sloughs are detached, pressure, with the usual lotions, must be carefully employed, as there are apt to be extensive sinuses; and if these have not a sufficiently dependent opening, it ought to be afforded by the knife.

When the ball, or any other foreign matter introduced into the wound, is not carried through, but remains, it ought to be removed, if this can be done without any very serious cutting or searching; for, though it is no doubt true that such extraneous substances often acquire a fibrous cyst, and cause no disagreeable symptoms, they more frequently excite inflammation, which leads to various troublesome consequences, and may do so after lying for a long while without causing disturbance. The finger is the best probe for detecting the ball or other foreign body; and when further search is requisite to find it, the nature of the tissues concerned ought to be carefully considered, since the direction of its course is much affected by those of dense and unyielding structure, as the bones, fasciæ, and even the skin. The velocity of the ball, and the position of the body when it entered, ought also to be taken into account.

When the injury is so severe as to render amputation necessary, it has been disputed whether the operation ought to be performed immediately, or be delayed until the primary inflammation subsides and suppuration is established. In reference to this question, the effects of gunshot wounds may be divided into four stages: 1. Confusion and prostration of strength, commencing immediately after the injury is sustained, and lasting seldom less than one or more than six hours, unless it terminates in sinking. 2. Return of strength, attended with more composure of mind, and sensation of the injury. This continues until inflammation begins, which is hardly deferred beyond twenty-four hours. 3. Inflam-

mation, ending in death, gangrene, or suppuration, and occupying from one to several days. 4. Suppuration, which continues until the patient recovers, or has his strength completely exhausted, and dies,—which may be in the course of weeks, or not until the end of months. Amputation may be performed with most advantage in the second and fourth of these stages. Different opinions were formerly entertained as to which of them was preferable; but the extensive experience of the military surgeons who were engaged in the Peninsular War decided the question; and it is now admitted that amputation during the second stage is out of all proportion more successful; to say nothing of the risk which men wounded on the field of battle must run, if permitted to go through the inflammatory stage, while their shattered limbs are subjected to the irritation of rough carriages, and their constitutions injured by the unwholesome air of crowded hospitals. Should the surgeon find that his patient does not rally within the period usually occupied by the first stage, though assisted by the stimulating effect of wine or spirits, he ought still to afford the chance derived from removal of the limb, unless the strength seems at so low an ebb that it would certainly sink under the shock of an operation; and, on the same principle, when inflammation has been allowed to come on, and seems proceeding to gangrene, amputation ought to be performed, as giving the patient a chance, however small, of escape from otherwise certain death.

Cannon-balls not unfrequently occasion contusions without any breach of the surface, varying from the slightest ecchymosis to complete destruction of the subjacent tissues, so that they are reduced to a gelatinous pulp. Sometimes when the contusion is sustained on the trunk, it causes instant death, in consequence of important organs being ruptured or otherwise injured. These effects used to be ascribed to the *wind of the ball*, or the air violently agitated by its motion. They are now more correctly referred to the action of the ball itself, which has had its velocity so far spent as to bruise merely without wounding.

Injuries from the Extremes of Cold and Heat.

The first effect of cold is to diminish the vital action of the part to which it is applied. This state of depression, when not carried

too far or continued too long, is succeeded by more than usual activity, or what is called reaction, especially if heat or any other stimulus co-operates with the natural tendency to excitement. If this alternation be frequently repeated, the part concerned becomes permanently weakened, being slightly swelled, of a purple color, and not so warm as usual. It is then easily affected by cold, becoming pale, contracted, and numb, and reacts with so much violence as to show symptoms of inflammation, becoming red, hot, itchy, and painful; not unfrequently vesicated and ulcerated. A part thus injured by cold is named a Chilblain.

Chilblains are most apt to occur in persons who possess weak powers of circulation, especially young females, and on the same principle take place chiefly at the extremities of the body, viz., the hands and feet. They ought to be guarded against by avoiding sudden and severe alternations of cold with heat. When formed, they should be protected from cold, and supported in their actions by stimulating embrocations, such as camphorated oil, strong spirits, or a mixture of *tinct. sap. c. opio*, with *tinct. lyttæ*, in the proportion of six of the former to one of the latter. The ulcer of chilblains presents the appearance of a smooth superficial excavation, with thick white edges, and a peculiar viscid slimy discharge. It heals most readily under the *unguentum oxydi hydrargyri rubri.*

More intense cold not only weakens, but entirely suspends vital action. The part becomes pale, insensible, and shriveled, and is said to be *Frost-bitten.* The extremities of the body, such as the fingers and toes, the ears and the nose, are most liable to be thus affected, both from their situation and comparatively languid circulation. A frost-bitten part is not dead, and when freed from the influence of the cold regains its power of action. It is difficult to determine how long the torpor may last without permanently depriving the part of life; but there is reason to suppose that the period is considerable; and it appears from the relation of Sir John Franklin, that an animal may be restored to its usual actions even after its whole body has been frozen.

In treating frost-bite, the great object should be to moderate the reaction, since, if it proves excessive, mortification readily occurs, both because the part is weak, and because its irritability being consequently increased, the inflammation is apt to be in-

tense. The best method is to use friction without any external heat, or even to effect it through a cold medium, such as that of snow, in order to promote the return of circulation, and at the same time guard against excitement. If inflammation comes on, the part ought to be soothed with poultices, or anodyne and astringent applications, such as a warm solution of acetate of lead with opium. Local bleeding would increase the weakness, and consequently render the diseased action more unmanageable; but general depletion will be proper if the patient is plethoric. Should mortification ensue, the best dressing will be a soft poultice until the sloughs separate.

Burns.—When a part is exposed to higher temperatures than usual, it becomes red, more or less swelled, and hot. If the heat applied is moderate, or of short duration, these symptoms disappear when it is removed; but when it is intense, or longer continued, the redness caused by it is bright and permanent, and there is a painful sensation of burning. The part is then said to be burnt, while in the former case it was merely excited. The inflammation thus induced may terminate in effusion of serum from the surface of the cutis, which detaches the cuticle and elevates it into blisters. When the heat is still more intense or prolonged, it destroys the life of the part. The cuticle is then detached and thrown into irregular folds, exposing the subjacent cutis discolored and dry. When the heat operates through the medium of fluids, its effects are named Scalds. Burns and scalds are always painful,—often long in healing, owing to the feeble action of the resulting ulcer, which is seated in parts that have been more or less injured by the heat,—and sometimes fatal by the shock to which they subject the constitution, by the profuse suppuration which they occasion, or by exciting inflammation of some internal part.

In treating burns, it is necessary to consider whether the injury is so severe as to destroy the vitality of the part affected, or merely sufficient to induce inflammation of it. In the latter case cold applications afford great relief, and if employed immediately after the accident occurs, may prevent the inflammation and vesication altogether. Another mode of treatment which answers extremely well, though it is difficult to say on what principle, consists in enveloping the burnt part with cotton. This

practice was introduced from America, and is now in very general use. It appears that its good effects are most conspicuous when pressure is conjoined with it; and a bandage, therefore, ought to be applied with moderate firmness. When blisters rise, the detached cuticle should be not only laid freely open, but taken away altogether, as its presence seems to increase the irritation. If ulcers remain, lotions of sulphate of zinc, or acetate of lead, are required to stimulate the granulating surface. It was formerly the custom to dress burns with unctuous matters, such as the carron oil, or *linimentum aquæ calcis;* but these applications are now almost entirely superseded by the means which have been mentioned.

When the burn is so severe as to destroy the life of the part, it must always be regarded as a severe injury. In very young or very old subjects, or those who on any other account are very weak, it is apt to induce immediate sinking; especially when it affects the trunk, and more particularly the abdomen. In patients whose powers of action are stronger, the local irritation generally occasions very smart symptomatic fever, and when the integuments of the thorax or abdomen are affected, there is a risk of the membranes lining these cavities internally inflaming from their contiguity. The constitutional treatment must depend upon the circumstances of the case. If the patient is drowsy, with cold extremities and a weak pulse, spirits, wine, and other cordials should be assiduously administered, while the body is warmly covered and sources of artificial heat are applied to the feet. If, on the other hand, the ordinary symptoms of inflammatory fever should be present, soothing means would be required. The local treatment of burns has afforded a fruitful field for diversity of practice and opinion, some using cold applications and means of a sedative kind; while others, as Dr. Kentish, have insisted upon the advantage obtained from employing oil of turpentine, and different stimulants of this sort. It will be found, however, that there is not so much room for doubt and question as may at first appear, since it is only in what may be called the first stage of burns, or that part of their progress which intervenes between infliction and ulceration, that any uncertainty exists as to the proper mode of treatment. If the injury is slight, that is to say, if the part affected still retains its vitality, I believe that cold

applications and cotton will in general prove most useful; and if the texture of the part be destroyed, there can be nothing better than a poultice, until the sloughs separate. In either case, ulceration sooner or later is established, and then the treatment will be the same for both.

Should the patient's strength prove inadequate to support the tedious and exhausting process of cure, if the part affected is seated on a limb, it ought to be amputated.

Poisons.

By poisons are understood agents which have the power of destroying the structure, or inducing disturbance in the actions of the body, independently of mechanical violence and temperature. Those which directly affect the structure are named Escharotic Poisons, or simply escharotics. Of these the most powerful are potass, the concentrated mineral acids, and some metallic salts, as the nitrate of silver, oxymuriate of mercury, and chloride of zinc. They are frequently used intentionally to remove morbid structures, etc., and are then named Caustics. Occasionally, whether from accident or design, they are applied so as to produce serious injury. In such cases, as their effect is generally completed before surgical assistance can be procured, the only treatment admissible is that which promotes separation of the slough and healing of the sore. Poultices, until the first of these stages is completed, and then lotions with pressure, afford most benefit.

Poisons, more strictly speaking, are those agents which produce their effects independently of chemical properties, as well as mechanical force and temperature; they do not directly alter the structure to which they are applied, but produce such changes in its natural actions as frequently give rise to the most important local and general consequences. A very large proportion of the articles comprehended in this class are employed to produce their effects in order to relieve the system from other diseases, whence they are named, not poisons, but medicines,—the former title being reserved to denote those which are distinguished by the potency of their action. The only poisons which present subject for surgical consideration are afforded by the animal

kingdom, and may be divided into—1. Those which exist naturally in the animals that yield them; 2. Those which are the results of diseased action; and 3. Those which depend on changes after death.

Natural animal poisons are afforded chiefly by the two classes of Insects and Serpents. In this and other temperate climates, the effects of those of the former are hardly more than local, consisting of pain, swelling, and redness of the part injured. The treatment, when any is judged necessary, should also be local; and the solution of muriate of morphia, or that of acetate of lead with opium, *aqua ammoniæ*, and other preparations of ammonia, afford most relief. There is considerable variety in the effect of these poisons, according to the irritability of the individual on whom they operate; and habit has a very remarkable influence in lessening it.

The poison of serpents produces more serious consequences, which vary according to the species which affords it. The most deadly sort occasions intense local pain, speedily followed by swelling of the limb, rapidly extending, and attended with mottled livid discoloration of the skin. The patient, almost immediately upon being bitten, feels sick, weak, and confused. He appears as if intoxicated, vomits, becomes quite insensible, and dies within a few hours, or it may even be minutes, after sustaining the injury. The viper, which is the only poisonous serpent in this country, hardly ever produces fatal effects; but the pain and swelling caused by its bite are often exceedingly distressing.

The treatment must be both local and general. The former consists in opposing the entrance of the poison into the circulation; the latter in counteracting its depressing effect on the vital powers. In accomplishing the first of these objects, the means of most use are—1. Removing the poison from the body, either by cutting away the part, or destroying it with caustics or cauteries;—the application of ammonia also seems to have some effect in preventing it from producing its characteristic effects; 2. Applying a tight ligature on the limb to compress the veins and other absorbent vessels; and 3. To direct the current of the fluids toward, instead of from, the injured part, by causing suction over it, which may be effected with the mouth, or a cupping-

glass. One or other of these proceedings may be trusted to chiefly, according to circumstances, but in severe cases it is proper to combine the operation of the whole. The general remedies are such as tend to prevent sinking, by creating a sort of artificial strength through their stimulating property. Ammonia, given pure or in the state of carbonate, with spirits, and warm water sufficient to make the mixture palatable, ought to be administered every five minutes. Arsenic has been strongly recommended also, as a remedy in such cases; and although it might be difficult to account for its salutary operation, the facts in proof of it are so striking and well authenticated, that when circumstances permit, this means should certainly be combined with the others. The arsenite of potass, or Fowler's solution, is the most convenient preparation for the purpose, and it has been said that very large doses, even to the extent of two drachms, may be given every half hour.

The morbid poisons originating in diseased action, which affect the human species, may all be produced by the human body; but two of them, cow-pox and hydrophobia, were in the first instance derived from the lower animals. They exist both in the liquid and in the gaseous state. In the former they hardly act unless inserted or inoculated into the texture of the body. In the latter, they produce their effects when received into the lungs during inspiration. It is only the first or inoculated poisons which belong to the surgical department. They always occasion more or less irritation of the part to which they are applied, and generally afterward more or less constitutional disturbance. Their *modus operandi* is not at all known. They seldom cause any immediate local alteration; and days, or even weeks, may elapse before there is any indication of their action. The constitutional disturbance follows, and after being fairly instituted, it cannot be subdued by removing the part on which the morbid matter primarily acted. The effect of some of these poisons will be more particularly considered hereafter. At present it may be observed, that the treatment proper for them in the first instance requires to be merely local, and should be conducted on the same principles of prevention as that of natural poisons. In regard to hydrophobia, it is believed that, if the injured part be cut out, or otherwise removed, any time before the constitutional

symptoms appear, the patient will be certainly protected from them.

The poisonous effects of dead animal matter are involved in considerable obscurity. It frequently happens that wounds received in the dissection of animals after death, whether for anatomical investigation or the preparation of food, are followed by troublesome consequences, both local and general. It is observed that those which have a punctured form are most apt to be so. Sometimes there is violent inflammation of one or all the tissues in the neighborhood, from the skin to the bone, terminating speedily in suppuration or sloughing. In the finger this constitutes what is called paronychia or whitlow. The absorbent vessels leading from the injured part often inflame, and by propagating their morbid action to the surrounding tissues, occasion hard painful cords under the skin and red lines on its surface. Still more frequently the lymphatic glands in the course of the absorbents inflame and suppurate. At other times the patient first complains of cold shivering, headache, and vomiting of bilious matter, after which the usual symptoms of fever come on, and are generally characterized by extreme irritation—the pulse being excessively quick—the respiration very hurried—and the countenance unusually expressive of anxiety. Along with this derangement of the system, a diffused inflammatory blush appears in the neighborhood of the injury, from which it soon extends itself irregularly in various directions, and terminating in mortification, proves fatal within a week or little more; or the patient may die, as it seems, merely from the exhausting effect of the irritative fever, with very little local appearance of disease.

Since the effects of punctures now mentioned differ from each other very much in kind, and are subject to no less variety in the degree of their severity, while they are all occasionally produced, so far as can be ascertained, by the same circumstances, it has been inferred that they depend not so much upon a poisonous influence in the subject dissected, as on peculiar irritability of the individual injured.

In regard to the treatment, it may be observed—1. That when punctures occur in suspicious circumstances, they ought to be converted into incisions, sucked, and touched with an escharotic. 2. That persons exposed to such injuries ought to lessen, so far

as possible, the irritability of their systems. 3. That when the effect is an acute and local inflammation, a free incision through the affected part affords most relief. 4. That when the absorbents inflame, warm solutions of acetate of lead with opium have the most soothing influence. 5. That when the lymphatic glands become affected, warm fomentations are the most powerful means of relieving the patient, which they do either by inducing the inflammation to terminate in resolution, or by hastening suppuration if it be inevitable. 6. That when the constitutional disturbance precedes the local affection, and there are signs of great irritation, scarifications of the inflamed parts, followed by hot anodyne fomentations, and accompanied with the internal administration of calomel, opium, and cordials, though they may seldom succeed in curing this most dangerous condition, seem to have more tendency to do so than general bleeding and the antiphlogistic regimen, which by increasing the weakness of the patient's system increase its irritability and render its treatment more unmanageable.

CHAPTER X.

AMPUTATION.

The expression Amputation, though sometimes applied to the excision of parts from the trunk, is generally confined in its meaning to the removal of limbs by the knife. In performing this operation, it is not sufficient merely to cut away what is diseased or injured, since the surface that remains ought to be left in such a state as will favor the healing of the wound, and afford a comfortable stump to the patient. Many different modes of operating have been contrived with the view of attaining these objects; and there is no department of practical surgery into which more improvements have been introduced in recent times.

Amputation was anciently performed by the direct and simple process of cutting down at once to the bone, and sawing it through on a level with the soft parts. But as in this way there was no

covering provided for the bone, whence followed a tedious and imperfect cure, various modifications were introduced to supply the defect. The muscles were drawn up by metallic plates, or pieces of cloth and leather, called retractors. Cheselden (1720) drew back the skin after it was cut, and then divided the muscular parts higher up. This method of *double incision* was carried further by Mr. Mynors of Birmingham, who dissected the skin and turned it back like the sleeve of a coat. Louis cut the muscles by two circular incisions, so as to divide the portion nearest the bone higher up than the external layer. Alanson, by holding his knife obliquely, while he made the circular sweep through the muscles, cut them at once in the same form that resulted from two successive incisions.

The object of all these contrivances was to leave the soft parts sufficiently long to cover the bone; but this they failed in accomplishing, excepting so far as concerned the skin; for the muscles being in the first instance cut higher than the integuments, and subsequently becoming still more diminished in length by the unopposed effect of their contractility, could hardly be made to meet over the bone, which often protruded during the cure, and required to exfoliate or to be shortened by the saw. The most simple and effectual plan for covering the bones was obviously to form one or more flaps from the part of the limb most able to supply them; and there can be no doubt that this mode of operating would have come earlier into general use, had it not been that prejudice in favor of the circular incision directed the attention of practitioners to its improvement. The operation by flap was performed occasionally during the last century and a half, and recommended by various surgeons who practiced it more or less extensively. Lowdham of London seems to have been the first of these (1696), and he was followed by Verduin (1697), Koenerding (1698), Sabourin (1702), and Vermale and Ravaton (1703). Toward the conclusion of last century, it was advocated by several of our countrymen in amputating the leg, of whom may be particularly mentioned Messrs. White (1760), O'Halloran (1765), Hey (1770), and Alanson (1780).

The alleged advantages of this method are—1. That it is much more quickly performed, and consequently much less painful to the patient, than the circular incision; 2. That it cuts the parts

smoothly, and leaves them in a state favorable to union; and, 3. That it affords a better covering for the bones than can be obtained from any modification of the other operation.

The flaps may be formed by cutting obliquely inward to the bone,—by transfixing the limb and cutting outward,—or by first cutting inward so as to obtain one flap, and then outward to form a second. The particular circumstances of the case often render one of these modes preferable to the others; but when the surgeon has his choice, he will generally find transfixion the easiest method. The size of the flaps, and proportion of muscle and integument composing them, must be regulated by the thickness of the bone and laxity of the soft parts. The flaps ought to be cut longer than would be sufficient to constitute a well-formed stump in the dead body, to compensate for the contractility of the muscles. When the skin is loose and the muscles attenuated, the surface of the flaps should be convex, to preserve the latter and diminish the extent of the former tissue. When, on the contrary, the limb is muscular and the skin tense, the knife should be made to describe a concave line, to prevent redundance of muscle.

For restraining hemorrhage during the operation, there are three means which may be used. The first of these is the tourniquet, contrived by Petit (1716), who, instead of the turn-stick, as it was called, and which had been previously employed, used a screw and couple of plates, which, being separated by turning the handle, effected the pressure more gradually, and so as to dispense with the services of the assistant who was employed to hold the turn-stick. This screw tourniquet, variously modified and improved, is the instrument still generally used for the purpose. The second method is compression of the aorta by a clamp surrounding the body, which has been found very useful in amputating at the hip-joint. The third mode of commanding the vessels is by simply compressing them with the hands. In certain amputations this is the only means that can be used, owing to the proximity of the operation to the trunk; and some surgeons, from the facility and dispatch attending it, never employ a tourniquet on any occasion. In cases where the tourniquet can be applied without doing harm, it ought to be preferred, as it relieves the assistant from a fatiguing duty, and prevents the patient from

losing so much blood, as he is apt to do when the vessels are subjected to manual pressure, if many of them require to be tied. The arteries ought to be pulled out with the catch forceps, and tied quite detached from their neighboring connections. After the principal vessels are secured, the tourniquet ought to be entirely removed, to prevent its slackened band from exerting such pressure on the veins as may cause them to bleed, and induce the surgeon to tie them instead of arteries.

The earlier modes of amputation rendered union by the first intention impracticable; and when the operation had been so far improved as to retain the soft parts sufficiently long to meet over the bone, the old system of dressing still continued in use, and the cavity of the stump was stuffed with lint, as all wounds were in those days healed by the granulating process. Mr. Alanson had the merit of exploding this practice, and introducing light superficial dressings in its stead, which greatly shortened the cure; and though surgeons on the Continent still interpose dressings between the edges of the stump, union by the first intention is always sought for in this country. Stitches, if necessary, ought to be employed to keep the lips of the wound nearly in their proper position; and when the bleeding has ceased, strips of adhesive plaster may be used to retain them in accurate contact.

The bad consequences of the operation are chiefly hemorrhage, sero-purulent effusion into other parts of the body, especially the cavity of the thorax, suppuration of the stump, and exfoliation of the bone.

Hemorrhage may appear immediately after the operation, either from arteries which have not been tied, owing to their not showing themselves by bleeding during the state of collapse succeeding the removal of a limb, or from the veins being compressed by too tight a bandage. In the former case, it is necessary to apply such additional ligatures as may be requisite; in the latter, it is sufficient to slacken the bandage. Hemorrhage sometimes commences a few hours after the stump is dressed; and then depends either upon a general oozing from the cut surface, consequent upon the reaction of the system, or upon some imperfection in the ligature of the vessels, which allows the blood to escape when impelled with more force than it was while the patient remained weak and faint. Cold lotions and pressure will restrain

it, if proceeding from the first of these sources; but additional ligatures will be required, if, resisting such means, it proves to be from the second of them. The hemorrhage occasionally does not occur until the third, fourth, or even seventh day; and then almost always depends upon ulceration of the artery. In this case, a ligature should be applied to the orifice of the vessel, if the bleeding cannot be arrested by pressure effected through means of compresses introduced into the stump, and a tight bandage applied externally.

When the stump does not unite, but inflames and suppurates, fomentations ought to be frequently applied until the discharge is fully established, when stimulating washes and pressure must be employed, to support the weakened action of the granulating surfaces and make them unite together.

Purulent effusions into internal cavities occur chiefly in weak, debilitated, irritable subjects, and have been accounted for variously. They are known to result in such habits from excited action, whatever be the cause producing it. Inflammation of the veins and blood-poisoning have also been supposed to be the cause of their occurrence. There are no means of remedying such effusions, and the only way of avoiding them is, so far as possible, to avoid operating in circumstances which predispose to their occurrence. Exfoliation of the bone is very troublesome, not only from delaying the process of cure, but by tending to render it imperfect through retraction of the soft parts composing the stump, which gradually takes place in the event of their not uniting over the extremity of the bone. It sometimes depends upon the injured or diseased state of the limb—and may also be occasioned by too free removal of the periosteum, or deficiency in the covering left for the bone. The most common form is merely a ring from the circumference of the bone, with irregular spicular prolongations upward. But occasionally the exfoliation is much more extensive, and extends in a conical form up the interior of the bone.

Particular Amputations.

The fingers may be amputated with most advantage at the joints. There used to be a prejudice against leaving an articular

surface, the cartilage of which was thought to exfoliate necessarily so as to render the cure more tedious and troublesome. Disarticulation was therefore avoided as much as possible, and when, from any circumstance, it appeared necessary, the precaution was taken of scraping off the cartilage. It is now well ascertained that union by the first intention generally occurs as readily after disarticulation as after amputation through the shafts of bones, and that when it does not take place, the only inconvenience experienced from the cartilage is a little increase and longer continuance of the discharge. Such being the case, though it would be wrong to amputate through a joint by preference, still, when there is any lasting advantage to be gained by doing so, the chance of bad consequences, so trivial, ought not to be regarded as a sufficient objection to it.

When the distal phalanx alone of a finger is affected, it ought to be removed by cutting into the joint on the dorsal surface, dividing the lateral ligaments, and then carrying the knife forward parallel with the palmar surface of the bone so as to save a flap to cover the stump: or the operation may be reversed by transfixing the finger while its palmar surface is turned upward, forming the flap, and then cutting through the joint. When the finger requires to be amputated above this joint, the operation should be performed by making two semilunar incisions, one on each side, or above and below, so as to form two flaps, which being dissected back will expose the bone, and allow it to be divided by the cutting-pliers. The flaps are then made to meet together over the face of the stump. The second phalanx might be removed at the joint in the same way as the first; but as the portion of finger thus left would be neither useful nor seemly, it is better, unless the patient refuses his consent, to take away the whole of it at its metacarpal articulation. In doing this, while the other fingers are held aside, the surgeon should place the point of his knife exactly over the summit of the joint, and cut first on one side and then on the other, obliquely into the palm of the hand to the point opposite that from which he set out, taking care to keep exactly in the angle formed by the integuments connecting the fingers. The flaps being detached, he may readily pass the point of his knife round the head of the bone. Lisfranc made one flap first, then carried his knife through the joint, and

completed the operation by cutting outward. When the parts retain their natural laxity, this proceeding is equally easy and expeditious; but if they are thickened and indurated, as is generally the case, the second flap is very apt to be injured in detaching the head of the bone; and even in the most favorable circumstances it is much more difficult to adapt the flaps properly to each other in this way, than in the one just described. One or two stitches are often useful in keeping the edges of the skin in contact. Of all the operations for amputating fingers this is the most important, from the frequency of cases requiring its application. The distal phalanx, indeed, almost never stands in need of removal by itself, since nearly all the morbid conditions to which it is subject from injury or disease admit of reparation; and it is of course always advisable to retain the extremity of the finger with its protecting nail, even though the bone, in whole or part, may be taken away; and when more than the distal phalanx must be removed, it is almost always better, in respect to appearance as well as use, to amputate the whole finger. When the fore or little finger requires removal, the articulating extremity of the metacarpal bone should be taken off for the sake of appearance.

When a portion of the metacarpal bone requires to be removed, the best method is to apply the point of the knife at the part where the bone requires to be divided, and cut down on each side of it, in the angle formed by the integuments between the fingers, so as to make the incisions meet below, opposite the metacarpo-digital articulation; and then divide the bone by means of the cutting-pliers, which were introduced into surgery by Mr. Liston at an early period of his practice,—and from their extensive utility may be regarded as the most valuable addition that has been made to the modern armory of the profession. When the metacarpal bone of the thumb is the one concerned, a portion of it may be removed by making two incisions, commencing where the bone requires to be divided, inclosing the thumb, and meeting together at the angle of union between it and the fore-finger. If it is necessary, the whole bone may be easily disarticulated through similar incisions. The same processes are proper for removing the metacarpal bone of the little finger in part or in whole.

The toes ought to be amputated on the same principles; but with the exception of the great one, which may be removed through the joint of the first and second phalanx, it is always proper in removing them to perform disarticulation between the first phalanx and metatarsal bone, since the small portion that might be allowed to remain could be of no use, and in all probability would occasion lameness. When more of the great toe than the distal phalanx requires removal, the operation should be performed through the metatarsal bone, in order to prevent its large articulating extremity from impeding recovery, and rendering the foot unseemly as well as inconvenient.

The disease requiring amputation sometimes extends to the tarsus, but is limited to the bones on one side of the foot—namely, the internal cuneiform and navicular on the tibial, and the cuboid on the fibular side. In this case, instead of amputating the foot, it is better to make a free removal of the diseased parts by taking them away, together with the metatarsal bones articulated to them. The operation should be conducted on the same plan as for the removal of a metatarsal bone by itself, and will be found hardly more difficult or serious. Partial amputation of the foot may also be performed transversely through the metatarsus, between the metatarsus and tarsus, and through the tarsus. The first and second of these methods are very seldom admissible, owing to the disease, which requires removal of a part of the foot, generally extending so far as to encroach upon the bones where they would need to be divided; and they are also objectionable from the difficulty which attends their execution, while there is no counterbalancing advantage in their favor, since, when once the anterior extremity of the longitudinal arch of the foot is taken away, no additional inconvenience results from removing a larger portion, so long as the posterior extremity or heel is allowed to remain. It has been objected that the extensor muscles of the ankle-joint, having no opponents left attached when amputation is performed through the tarsus, must draw up the heel and point the cicatrix to the ground. But experience has proved that this unpleasant consequence is considerably opposed by the flexor tendons adhering to the cicatrix.

The operation through the tarsus, which was invented by

Chopart, had been entirely neglected in this country, but came into pretty general use after I performed it (1829).

The blade of the knife employed should be about six inches long and half an inch broad, sharp at the point and blunt on the back. The tourniquet ought to be applied immediately above the ankle, having compresses placed over the posterior and anterior tibial arteries. The surgeon should measure with his eye the middle distance between the *malleolus externus* and the head of the metatarsal bone of the little toe, which is the situation of the articulation between the *os cuboides* and *os calcis*. Placing his fore-finger here, he ought to fix his thumb on the other side of the foot directly opposite, which will show him where the *os naviculare* and *astragalus* are connected. An incision somewhat curved with its convexity forward is then to be made from one of these points to the other, when, instead of proceeding to disarticulate, the operator should transfix the sole of the foot from side to side at the extremities of the first incision, and carry the knife forward, so as to detach a sufficient flap, which must extend the whole length of the metatarsus to the balls of the toes. The disarticulation may finally be completed with great ease, as the shape of the articular surfaces concerned is very simple and nearly transverse.

The plantar, anterior tibial, and any other arteries that require to be secured, must then be tied, and the flap having been secured in its place by a few stitches, some light dressing ought to be applied. During the cure the knees ought to be kept bent to relax the *gastrocnemius*.

As disease of an incurable kind frequently affects the joint between the *os calcis* and the *astragalus*, and also the ankle-joint itself, beyond the reach of any partial amputation of the foot, some attempts had been made to remove it at the ankle, by making a flap from the integuments of the instep, but with results so little satisfactory, that amputation of the leg continued to be the established means of remedy in such cases. In 1842, I accomplished the object in a different way, by preserving the thick integuments of the heel for covering the ends of the bones, and this may now be considered the proper procedure for effecting removal of the foot when practicable.

When the operation is to be performed, pressure should be

made on the tibial arteries by the fingers of an assistant, or a tourniquet applied above the ankle. The only instruments required are a knife, of which the blade should not exceed four inches in length, and a saw. The foot being held at a right angle to the leg, the point of the knife is introduced immediately below the malleolar projection of the fibula, rather nearer its posterior than anterior edge, and then carried across the bone to the inner side of the ankle, where it terminates at the point *exactly opposite* its commencement. The extremities of the incision thus formed are then joined by another passing in front of the joint. The operator next proceeds to detach the flap from the bone, and for this purpose, having placed the fingers of his left hand over the prominence of the *os calcis* and inserted the point of his thumb between the edges of the plantar incision, guides the knife between the bone and nail of the thumb, taking great care to cut parallel with the bone, and to avoid scoring or laceration of the integuments. He then opens the joint in front, carries his knife outward and downward on each side of the astragalus so as to divide the lateral ligaments, and thus completes the disarticulation. Lastly, the knife is carried round the extremities of the tibia and fibula, so as to afford room for applying the saw, by means of which the articular projections are removed, together with a thin connecting slice of bone covered by cartilage. The vessels being then tied, and the edges of the wound stitched together, a piece of wet lint is applied lightly over the stump, without any bandage, so as to avoid the risk of undue pressure in the event of the cavity becoming distended with blood, which would be apt to occasion sloughing of the flap. When recovery is completed, the stump has a slightly bulbous form, from the thick cushion of dense textures that cover the heel, and readily admits of being fitted with a boot.

The advantages which I originally anticipated from this operation were—*first*, the formation of a more useful support for the body than could be obtained from any form of amputation of the leg; and, *secondly*, the diminution of risk to the patient's life, from the smaller amount of mutilation, the cutting of arterial branches instead of trunks, the leaving entire the medullary hollow and membrane, and the exposure of cancellated bone, which is not liable to exfoliate like the dense osseous substance of the

shaft. From my own experience, and that of many other practitioners who have adopted amputation at the ankle, I now feel warranted to state that these favorable expectations have been fully realized, and that in addition to its other advantages, this operation may be regarded as almost entirely free from danger to life. It also has the great advantage of removing not only the bone already diseased, but the whole of that spongy portion which may be disposed to suffer in the same way, as not unfrequently happened after the operation of Chopart.

Some attempts have been made to improve this operation by varying the form of the flap, and by retaining the astragalus or tuberosity of the os calcis. But all of these modifications seem to lessen the simplicity, facility, and efficiency of the operation; more especially the one last mentioned, which was proposed by M. Perigoff of St. Petersburg, appears objectionable, by complicating the process, exposing to the risk of relapse by retaining a portion of the tarsal bones, and impeding the use of an artificial foot by rendering the limb inconveniently long.

The circumstances which were formerly held to require removal of the leg so generally admit of relief through amputation at the ankle, that the former operation is now rarely necessary in practice. Indeed, I have of late years performed it chiefly for the remedy of useless or uncomfortable stumps, resulting from amputation by flap at the middle or higher part of the leg. There can be no doubt that in these situations the flap method is very apt to leave a mass of redundant substance, affording no protection to the bone, which, having nothing to cover it except an imperfect cicatrix, is a perpetual source of discomfort and suffering. In order to prevent the risk of such unpleasant occurrences, and also to afford relief from them when they have unfortunately taken place, I think amputation of the leg should always be performed on the following principles:

In the first place, it does not seem desirable for any useful purpose to retain a longer stump than when the tibia is divided at the distance of an inch below the tuberosity; and as the cancellated texture of this part is less prone to exfoliation than the dense substance of the shaft, it is therefore improper to operate lower in the limb. Secondly, since a covering of muscle is not essential to the formation of a good stump, as may be seen from

the results of amputation at the ankle, and since the attempt to retain a muscular cushion below the knee is, as has just been mentioned, apt to leave the bone in an exposed state, the operation should be so conducted as to make sure of obtaining a sufficient protection from the integuments. On the whole, I believe, from ample experience, that the following mode of procedure, founded upon these principles, is the most eligible that can be adopted:

A tourniquet having been applied above the knee, two semilunar incisions are to be made through the skin, from side to side of the limb, with their convexities downward, and their extremities meeting about two inches below the tuberosity of the tibia. The flaps thus formed are then to be detached from their subjacent connections, so as to expose the bones at the distance of an inch below the tuberosity. The muscles are next divided behind about the middle of the extent to which their surface has been exposed, and then on the other side on a level with the line where the saw is to be applied. Allowance having thus been made for the unequal retraction of the anterior and posterior muscles, the surface of flesh and bone presented after the operation is perfectly even, and admits of being covered by the flaps of integument without either straining or redundance. The stump thus formed may either be rested on the knee, or employed so as to retain the use of the joint, by means of an apparatus consisting of a hollow cone secured by straps buckled round the knee.

Amputation of the leg may also be performed very conveniently at its lower end, a little way above the ankle, by forming two flaps of nearly equal size from the anterior and posterior parts of the limb. The result of this operation is a stump certainly not equal to that obtained at the ankle-joint, but still very suitable for the adaptation of an artificial foot.

Amputation of the thigh has afforded by far the most keenly contested field for conflicting opinions in regard to the best mode of operating. Until about forty years ago, the operation by circular incision, or cutting the integuments so as to provide a covering for the bone, was invariably practiced by British surgeons both at home and abroad. But the flap method—which, though taught, and, at a former period, to some extent practiced, on the Continent, had not been applied to the thigh in this country—

was strongly advocated by the late Mr. Liston, and also by myself, as may be seen from our papers in the Edinburgh Medical Journal of that period, and came into general use. Indeed, before the introduction of anæsthetic means, the facility and rapidity of this operation, by greatly lessening the patient's sufferings, gave it a great advantage over the other process; and it was also supposed that a muscular covering for the bone would prove of great service. While, however, the former of these considerations has ceased to be of any consequence, the latter was contradicted by experience, since it appeared that the muscles were liable to such retraction as not only prevented their union over the bone, but withdrew the integuments so as to prevent them from doing so. Various attempts were made to obviate these bad effects, by modifying the length and direction of the flaps, by making them anterior and posterior instead of lateral, and by varying their relative proportions, with little success, until Mr. Teale, by making a very long anterior flap, has relieved the operation from its great defect.

In operating at the lower third of the thigh, when a sufficiently long anterior flap cannot be obtained for the purpose, I think the circular method should be preferred, and have long employed it with the most satisfactory results, by making two semilunar incisions from side to side, close above the patella, reflecting the skin, dividing the muscles as high as they are exposed in front, and a little lower behind, to allow for the difference in their retraction; and lastly, drawing them upward, so as to let the saw be applied two inches higher than the muscular incision in front.

The thigh may be amputated at the hip-joint; but in this case the shock inflicted on the system is so great, and the wound which remains to be healed is so extensive, that the operation ought never to be performed unless the patient's situation affords him no other chance of escape from certain death. There are various modes of operating, the choice of which must be regulated by the circumstances of the case, but in general the following one will be found the most eligible, in respect both to the ease of its performance and to its result:

An assistant should grasp the limb as high as possible, pressing with his thumbs upon the artery in the groin, where it lies on the

brim of the pelvis, and with his fingers upon the hip. The surgeon introduces the point of a narrow knife about ten inches long, nearly half way between the spinous process of the ileum and *trochanter major*, thrusts it through transversely before the bone so as to form an anterior flap, which, being held up by an assistant, he makes another from the posterior parts, then desires the limb to be abducted, opens the joints, and completes the disarticulation.

The fore-arm ought to be amputated by making two equal flaps, from before and behind; the arm being held while this is done in the middle state of supination and pronation, in order to relax the muscles equally and thus facilitate the operation. The hand may be removed at the wrist-joint by transfixing the limb laterally and forming a flap from the palmar aspect; but the longer stump thus obtained is not found to facilitate the adaptation, or increase the utility, of an artificial hand; and the large articular surface which remains, though it may not materially delay the cure, must always cause deformity.

The arm may be amputated above the elbow, either by double flap or circular incision; but the former mode is greatly preferable. A tourniquet is here quite unnecessary, as the vessel can be compressed easily and effectually by the hand placed over it at the inner edge of the biceps.

Amputation at the shoulder-joint is not unfrequently required, and may be performed in various ways, with three of which the surgeon should be familiar, as the state of the parts concerned sometimes leaves no room for choice.

1. The circulation through the subclavian artery being arrested by pressure with the thumb above the clavicle, where the vessel issues from between the *scaleni* and rests on the first rib, the surgeon thrusts a sharp-pointed knife down to the head of the humerus, immediately below the acromion process; and cutting downward in a semilunar direction, first on one side and then on the other, so that the two incisions meet in the axilla, he forms two lateral flaps, which, being dissected back, expose the joint, and enable him to effect the disarticulation very readily, by pushing his knife through the capsular ligament and then cutting round the glenoid cavity.

2. The surgeon introduces the point of a long narrow knife a

little nearer the clavicle than the middle space between the acromion and coracoid processes, thrusts it downward and backward until it issues at the inferior margin of the axilla, and then cuts in the same direction, so as to form a large external flap. Having, in doing this, cut through part of the capsular ligament, he has no difficulty in passing the knife round the head of the humerus and making a suitable flap from the remaining parts, the assistant introducing his finger as soon as sufficient room is afforded for the purpose, and compressing the vessel. If the left arm is the subject of operation, the knife may be introduced at the lower margin of the axilla, and brought out at the point where it is entered in the former way.

3. The surgeon cuts in a semilunar direction from one side of the deltoid to the other, so as to form a large flap of this muscle, which, being dissected from its subjacent connections, and held up, exposes the joint, allows the disarticulation to be completed, and permits the fingers of the assistant to be introduced to compress the vessels before they are divided, together with the remaining muscles and integuments, by a transverse incision.

After all of these operations, of which the one first mentioned should be preferred when circumstances permit its performance, which is generally the case, the arteries ought to be tied, the edges of the flap stitched together, and a proper bandage applied.

The Scapula is liable to the formation of morbid growths, which have on various occasions led to partial, but never to its entire removal, until I performed this operation six years ago. It might be expected that the arm concerned, in the event of being preserved, must remain a mere useless appendage; but on the contrary, experience has shown that its strength and mobility are sufficient for all ordinary purposes. There is now discharging the duties of a provincial letter-carrier, one of my patients, who can lift heavy weights, and has the perfect use of his arm from the elbow downward. Indeed, there is not only complete mobility but also a considerable power of motion at the shoulder from the *trapezius*, and other muscles—which were attached to the scapula—acting through adhesion to the soft textures lying between them and the humerus.

The scapula may be removed either alone or together with the

arm. In the former case, two incisions should be made in this form †, one extending from the clavicle, a little nearer the sternum than its connections with the arenoid process; and the other, being transverse in its direction from the acromion to the posterior edge of the tumor. The flaps thus formed having been dissected from the subjacent surface, the clavicle is divided at the part where it is exposed, and held outward by an assistant, while the operator cuts through the articular textures and separates the muscular attachments, while another assistant compresses the axillary plexus, with his hand introduced through the wound. The vessels are then tied, the cut edges stitched together, and the arm supported by a sling.

When the arm also requires to be removed, the process is still more simple. Two semilunar incisions should extend from the acromion process downward, on each side of the shoulder, to the inferior angle of the scapula; the operation in other respects being conducted as in the former case.

CHAPTER XI.

BONES.

Fractures.

THE osseous tissue resembles, in general, the other vascular parts of the system as to the healthy and morbid actions of its nutritious system, but is remarkably distinguished by its power of reproduction. It is not possible to explain on what this difference depends, but its existence is of great consequence in remedying the accidents to which bones are most exposed by their rigidity—viz., Fracture.

Bones may be fractured in three ways—1. By external violence operating directly upon the injured part; 2. By external violence causing a strain upon the bone so as to break it, not where the force is applied, but at some other part of its extent; 3. By inordinate action of the muscles. Fractures result most

frequently from the first and second of these causes, and very rarely from the third. They occur at all periods of life, but are more frequently met with in particular bones at one age than another. In children, the thigh-bone, humerus, and clavicle; in adults, the bones of the leg and fore-arm, the shaft of the femur, the humerus, clavicle, and ribs; and in old people, the neck of the femur, are the bones most liable to be broken. Independently of diseased conditions to be mentioned afterward, which render the bones more subject to fracture, it would appear that the bones of some individuals are more easily broken than those of others. Fractures may be transverse or oblique in respect to the axis of the bone—they may be single or comminuted—and they may be attended with a wound exposing the bone, or without one, whence they are divided into Compound and Simple. In explaining the symptoms and treatment of fracture, it is necessary to consider separately the two departments of this last division, which is of great importance.

Simple Fractures.

The symptoms of simple fracture are—1. Distortion or change of shape, owing to the broken bone being unable to counteract the displacing tendency of the surrounding muscles and the weight of the limb itself; whence are caused shortening or retraction, the extent of which depends upon the obliquity of the fracture, and rotation. 2. Diminution or total loss of voluntary motion. 3. Preternatural mobility by external forces. 4. Swelling from the effusion of blood by ruptured vessels, and from the same source the discoloration of ecchymosis appearing some time after the accident. 5. Pain and spasmodic starting of the muscles, owing to the irritation of the sharp extremities of the bone. 6. Crepitus, or a grating sensation when the limb is moved, from the rough osseous surfaces rubbing against each other.

When the extremities of a broken bone are allowed to remain at rest they unite together, and if examined by a section afterward, exhibit a mass of new osseous matter, which serves as their bond of union. The old surgeons believed that this *callus*, as it was called, resulted from an effusion poured out by the surrounding soft parts, in consequence of the irritation of the injury,

which concreted about the broken bones and united them together. The great object of treatment, according to this view, was, by local pressure, to restrain the effusion from going beyond due bounds. For this purpose short splints, or pieces of wood, pasteboard, or iron, were tightly bandaged to the limb over the injured part. Mr. Pott had the merit of exposing to the surgeons of this country the impropriety of such a practice, and introducing another more scientific as well as practically useful.

Mr. Pott attributed exuberance of the callus to imperfect adjustment of the broken bones, which, causing irregularity and projection of their extremities, consequently rendered their union large and clumsy. He therefore insisted upon carefully setting or replacing the fracture, and in doing this pointed out the importance of relaxing, by proper position of the limb, those muscles which by their contraction caused or increased the distortion. Here he remarked very justly, that what is usually called the riding or rising end of the bone, from its seeming to project, is, with some few exceptions, really in its place, and appears prominent merely because the other is drawn in an opposite direction by the muscles. He showed the folly as well as danger of attempting to squeeze down the projection by local pressure, and discarded the short splints which were employed for this purpose. But in order to retain the proper position after obtaining it by due relaxation of the muscles, and prevent the weight of the limb, the movements of the patient, and the spasms of the irritated muscles from causing displacement, he recommended the use of splints long enough to extend beyond the joints at both extremities of the broken bone.

The process by which reunion is accomplished can seldom be inspected before its completion, and experiments on the lower animals are not to be regarded as affording unexceptionable evidence; it has therefore been very variously explained, and still remains in some points rather obscure. The following steps seem to be well ascertained. In the first place, the parts which form the cavity that incloses the fractured extremities of the bone become thickened and consolidated by the interstitial effusion and organization of lymph. The medullary membrane undergoes a somewhat similar change, while the surface of the bone acquires a covering of gelatinous-looking lymph. The sort of capsule which

is thus formed by the indurated periosteum, muscles, fat, or whatever other tissue happens to be concerned, gradually becomes firmer, and has ossific matter deposited in its substance, generally in largest masses where the periosteum still adheres to the bone. The broken extremities are thus by degrees joined together and rendered immovable, but still remain unable to resist any considerable force which tends to separate them. The process of ossification then proceeds inward from all the surface, both of the old bone and that of newly formed. A fibro-cartilaginous sort of mass fills the cavity that exists while this is going on, and when the cure is completed, the bone, if divided, exposes a compact osseous mass, which in the course of time acquires a cancellated texture, but has not the medullary canal perfectly restored.

The time required for this process varies with the size of the bone, being performed most quickly when it is smallest, and *vice versa*. The shaft of one of the large bones, such as the femur or tibia, generally acquires rigidity in the course of four or five weeks, but does not regain sufficient strength for supporting the body or performing locomotion until several weeks afterward, and, so far as can be judged from the opportunities of observation occasionally afforded, is not completely ossified at the fractured part before the lapse of several months. The age, constitution, and peculiar circumstances of the patient also cause variations in the process of cure. It is most speedy in youth and health. In pregnancy it is alleged to be performed in general with less energy than usual. Rest of the limb promotes it, and motion not only retards, but if considerable or long continued, altogether prevents it; in which case the substance that ought to have formed the new bone acquires the appearance and properties of ligament, so as to render the limb flexible, and constitute what is called an artificial joint, the different kinds and treatment of which will be more particularly considered afterward.

In treating fractures, it is of great consequence to set or replace the extremities of the bone as soon as possible after the injury is sustained, in order to prevent the bad effects of their continued irritation, to effect the adjustment before it is impeded by swelling of the limb or thickening of the parts which surround the bones, and to avoid disturbing the process of reunion by altering the position of the broken surfaces at a later period. When

swelling and tension are actually present, it is sometimes thought proper to delay the adjustment until these symptoms are subdued by leeches and fomentations; but as such means can have little effect while the cause of irritation continues in operation, it is always better to reduce the bones into their proper situation as soon as possible, and then keep the limb steady by means of splints. The best material for splints is thick pasteboard, or thin wood split longitudinally into narrow portions, and covered with leather. They should be long enough to extend beyond both ends of the fractured bones, and broad enough to equal the diameter of the limb. Those of the former kind must be well softened by immersion in hot water, or being thoroughly moistened with it, and then padded with carded tow, lint, or flannel. There are usually required two splints, one for each side of the limb, and the best bandages for retaining them are the looped bandage, the tailed bandage, and the common roller. The first of these consists of narrow strips of calico about an inch and a half broad, and long enough when folded double to pass round the limb with a few inches of excess; one of the ends is then drawn through the loop and tied to the other. The number of pieces thus applied varies with the length of the limb, as there ought not to be more than three inches between them. This bandage is useful when the degree of tightness requires to be occasionally altered and the limb cannot be moved without disadvantage. The tailed bandage consists of a common roller, divided into pieces long enough to encircle the limb somewhat obliquely, and cross over far enough to keep their hold. Six, eight, ten, or whatever number of these the length of the limb requires, are placed transversely under it, so that each overlaps the one above it about two-thirds. The lowest one is then drawn tightly round the limb, and while its ends are still held by the surgeon or his assistant, the one next above is applied in the same manner, so as to secure the former, and so on until the whole are thus disposed of. This bandage effects a very equable pressure, and can be changed without disturbing the limb; but it does not admit of partial relaxation or tightening. The common roller is the simplest and easiest of all the means for the purpose, but can be only used where the limb may be moved without any inconvenience. There are various contrivances for assisting the splints and

bandages in preserving the proper position; but they will be best explained along with the particular circumstances requiring them. Another method of treating fractures has of late years been introduced, though there seems great reason to question its superiority over that previously in use. It consists in closely enveloping the injured limb with pasteboard and bandages, covered with starch. Some practitioners apply this immovable apparatus, as it has been called, immediately after the receipt of the injury, but others wait a few days until the tension and engorgement of the limb subside. The great advantage contended for is the abridgment of confinement, since the patient, so soon as the bandages become dry and firm, may quit his bed without danger of displacing the broken surfaces. On the other hand, it may be stated, that the process of dressing is not only tedious and requiring great nicety in its execution, but, unless he be carefully watched, must expose the patient to the risk of various bad consequences, from alterations in the size of the limb occurring subsequently to its adjustment. On the latter account, especially, this mode of treatment seems most suitable in hospital practice; and here, again, as the patients have no object but a speedy recovery, there does not appear to be any benefit derived from treating them propped up in chairs, or moving about on crutches, instead of being allowed to lie quietly in their beds.

Compound Fractures.

The wound which constitutes the distinguishing character of compound fractures occasions a most important difference in respect to the danger and difficulty of cure attending them. There is apt to proceed from this source violent inflammation with fever, terminating in profuse suppuration or gangrene, or death without any remarkable local change, merely from the effects of constitutional disturbance. These consequences used to be ascribed to the admission of air, but are now referred with more reason to the inflammation of an extensive wound implicating important and irritable tissues; for unless the orifice of the cavity heals by the first intention, its surface must necessarily inflame as the first step to granulation. The great object in treat-

ing such injuries is consequently to obtain immediate union, and thus convert them into simple fractures.

If the bone projects through the wound, a portion ought to be removed from its extremity by the saw or pliers, sufficient for allowing it to be easily replaced. To prevent irritation, which is so adverse to adhesion, the bones ought to be carefully set as soon as possible; and to keep down inflammatory action, cloths wet with cold water should be assiduously applied, until there is no longer any fear of it, or until it actually commences. With the same view, the patient must be confined to the most strict antiphlogistic regimen; and if inflammation comes on, fomentations and poultices should be substituted for the cold applications. Bleeding is to be used with great caution, since the patient, if he survives the immediate danger, will have to support a copious and profuse suppuration; and those means which subdue violent action without permanently weakening the system ought to be preferred. So soon as the inflammatory tension begins to subside, the relaxing applications must be changed for those of a stimulating and astringent kind. The lotions of acetate of lead, sulphate of zinc, etc., are the best adapted for this purpose. Counter-openings, if required, should be made to afford the matter free vent, and pressure must be carefully effected by compresses and bandages, while the most unceasing attention is bestowed on the preservation of proper position and perfect rest. The patient's strength requires of course to be supported by nourishing food. Pieces of bone occasionally become detached during the cure, and delay or prevent it; they ought therefore to be diligently searched for and extracted.

When the injury is so severe as to preclude the possibility of recovery, amputation must be performed. The circumstances to be taken into account in determining on this proceeding are— 1. The state of the soft parts; 2. That of the blood-vessels and nerves; 3. That of the bones; 4. That of the patient's constitution; 5. That of the means for proper treatment. It is possible that any one of these circumstances may be so unfavorable as to render the measure in question necessary, but it more frequently happens that the surgeon is influenced by several or all of them in deciding on the operation. It will, of course, always be desirable to save the limb, but even when the circumstances of the

injury seem favorable for attempting this, if there is a want of proper attendance or other requisites for success, amputation should be decidedly preferred to endangering the patient's life.

Particular Fractures.

HANDS AND FEET.—The phalanges of the fingers and toes, owing to their shortness and mobility, are little subject to fracture. The injury, when it does occur, is readily recognized, and easily treated by means of a narrow wooden splint, padded with lint, and supported by a roller. In treating fracture of the proximal phalanx of the fingers, it is difficult to keep the bone straight in the extended position, owing to the effect of the flexors in drawing the broken ends downward, and it will be found more convenient to fill the hollow of the hand with tow or some other soft material, and then bind down the fingers upon it. The metacarpal and metatarsal bones are more frequently broken, when there is little displacement, but considerable swelling, pain, and crepitus, with preternatural mobility of the corresponding finger or toe. A compress of tow, supported by a roller, prevents motion of the fractured extremities, which is all that the case requires.

BONES OF THE LEG.—The fibula is apt to be fractured by twists of the foot outward, and usually gives way from about an inch to an inch and a half above its inferior extremity. The eversion of the foot, and its mobility in a lateral direction, with the pain and crepitus caused by the broken surfaces, render the injury very distinct. The best mode of treatment is that devised by M. Dupuytren. It consists in placing on the inner side of the leg a thick cushion, to which, after having been secured in its place by means of a roller, a wooden splint, long enough to extend beyond both the foot and the knee, is fastened; and then applying a bandage at each extremity of the splint, so as to draw the foot and upper end of the tibia toward it, and thus effectually counteracting the distortion which is caused by the weight of the limb and the action of the peroneal muscles. Sometimes along with this fracture the foot is found displaced not to the side but backward, in which case the heel is remarkably elongated and the instep shortened. After the parts have been adjusted by suitable

extension and pressure, the same apparatus is to be used, with this difference, that the cushion and splint are placed in front. Dupuytren directed them to be placed behind, but I have not been able to attain the object desired in this way. The lower end of the splint should have the form of a horseshoe, so as to embrace the instep. When the fibula is fractured higher up, the cause is generally direct violence, and the symptoms are so obscure, that, unless the examination be instituted early, before swelling comes on, it is difficult to decide whether the bone is broken or not. The treatment requires merely a roller applied from the toes upward, to prevent motion.

The tibia is occasionally fractured, while the fibula remains entire, generally in consequence of falling from a height on the heel, and gives way most frequently a few inches from the lower end. There is usually not much displacement, but great pain, and complete loss of power over the leg. The treatment is easily conducted, since it requires merely the use of means for preventing motion; and a couple of pasteboard or leather splints, secured by the looped bandage, so that they may be relaxed or tightened according to the degree of swelling, will be found sufficient for the purpose, the limb being laid on its outer side, with the knee bent.

The tibia and fibula are very often broken together. The fracture is generally oblique, and seated about the middle, or toward the lower third of the limb. The two bones seldom give way opposite to each other, and frequently do so at the distance of several inches. The accident sometimes results from direct violence, but more usually is caused by strains on the shafts of the bones, from twists or falls. There being in this case no longer any resistance to the distorting tendency of the weight of the limb and the retraction of its muscles, there is always much eversion of the foot and bending of the leg, the upper extremity of the tibia pressing upon the skin, or projecting through it, owing to the lower one being pulled upward and backward by the *gastrocnemii* muscles.

Various methods are followed in treating this common and important fracture. It is evident that the extended position is objectionable, from not affording any relaxation to the muscles which produce the distortion, and that, therefore, the knee ought,

if possible, to be bent. This may be done either by simply laying the limb on its outer side, properly supported with splints, or by placing it on a double inclined plane. It will be found that, owing to peculiarities in the seat and direction of the fracture, the extremities are retained in apposition more easily, sometimes by one of these modes, sometimes by the other. When the fracture occurs very near the knee, the upper fragment becomes subject to the action of the extensors of the knee, and the straight position, consequently, is required to keep the broken surfaces in contact.

The patella is occasionally fractured, both by the direct effect of external violence, and also, as it appears, by inordinate contraction of the muscles attached to it. In the former case, which is more rare than the other, the fracture is generally comminuted, and sometimes longitudinal. In the latter, it is always transverse, and allows the two portions to be widely separated, so that the condyles of the femur can be felt between them. The nature of the injury is consequently very obvious, and is still further indicated by the complete loss of power over the joint which attends it. When the fracture is longitudinal or comminuted, it is distinguished by pain, mobility of the fragments, and crepitus.

Reunion of the transverse fracture is opposed by the following circumstances: 1. The difficulty of approximating the broken surfaces, and keeping them steady. 2. The presence of the fluid of the joint, which is secreted in increased quantity, owing to the irritation of the injury. 3. The want of vascular parts to assist in forming the new bone. Osseous union consequently seldom, or almost never, takes place; and there is formed merely a sort of ligamentous connection, varying from a few lines to several inches in extent. The treatment ought always to be conducted, however, as if a complete cure were practicable, so that the flexible medium of connection may be rendered as short as possible. With this view, the limb ought to be laid out not only straight, but also somewhat elevated by a pillow, to relax the pelvic extremity of the rectus muscle. A wooden splint having been placed under the knee, a single circular turn of a roller should be applied above, and another below, the portions of the bone, the broken surfaces of which may then be drawn very nearly

into contact by tying two longitudinal bands introduced under the circular ones, alongside of the patella. A more effectual apparatus consists of two pieces of leather three or four inches broad, and long enough to surround the limb above and below the patella; they are provided with straps and buckles for rendering them tight and drawing them together, and their respective edges are cut out in front to receive the bone. Some discutient lotion to promote absorption of the effused fluid may be employed if necessary.

When the fracture is longitudinal, little or no displacement occurs, and all the treatment required consists of lateral compresses with a bandage. In this fracture the union is osseous, because most of the adverse circumstances which operate against bony union in the former case are absent.

The thigh-bone, notwithstanding its great strength, is very frequently broken, sometimes by direct violence, but more commonly by the strain which happens in falling, particularly on the side. In adults, it usually gives way at the lower third; in children, at or above the middle; and in old people, at the neck or trochanters. When the shaft is broken, the symptoms are those generally characteristic of fracture, and, in particular, more or less shortening of the thigh, according to the degree of obliquity of the surfaces of the bones, the lower extremity being almost always drawn up behind the superior one, together with rotation of the foot outward, owing to the weight of the limb. The only cases in which I have found the lower end anterior to the upper one, happened from direct violence.

As the thigh is covered before, as well as behind, with muscles which extend beyond both the joints at its extremities and are nearly equal in strength, it is obvious that no position can have the effect, as in the leg, of relaxing them on one side without stretching them on the other. Various mechanical contrivances, therefore, have been invented for permanently extending the limb, of which the long splint of Desault far surpasses all the others in simplicity and efficiency. It is merely a board about four inches in breadth, long enough to extend from the false ribs a few inches beyond the sole of the foot, and having at each end two holes for the attachment of bandages. The patient's bed having been prepared by being rendered smooth and firm, his

limb is extended until it corresponds in length and direction with the sound one; then a pasteboard splint, properly softened and padded, is applied on the inner side of the thigh, extending from the perineum to beyond the knee, and another on the outer side, reaching from the *trochanter major* as far down as the former. These splints being secured by four or five looped bandages, the board, wrapped in a sheet or tablecloth, of which enough should be left to surround the thigh, is placed alongside the limb, and a handkerchief passed under the perineum is tied to its upper end, while the foot is secured to the lower one. The unfolded part of the wrapper which lies under the limb is then brought over and fastened to the splint, a handkerchief at the same time being tied round the patient's body to prevent any lateral displacement of the apparatus.

I have long been satisfied that the long splint proves useful not by effecting extension, but simply by preventing motion in all the joints of the limb. For it is well known that perfect quiet can be obtained only in this way, and also that putting a muscle on the stretch would be the most certain means of exciting its contractile tendency. If the fractured surfaces are placed in proper position and supported by lateral splints nothing more will be required but the prevention of movement, while the strongest extending force will prove inadequate to correct any defect of the original adjustment.

The plan of treatment recommended by Mr. Pott, which was to lay the limb on its outer side with the knee bent, and merely apply two pasteboard splints to prevent the ends of the bones from moving, is very objectionable. It does not afford sufficient rest, and renders a permanent eversion of the limb almost unavoidable, from the patient turning on his back during the cure, and thus causing the bones to unite in such a manner as to produce this effect. The double inclined plane, of various forms and materials, is much used, and has the sanction of high authority. It is alleged to relax the muscles by a bent position of the joints, without occasioning the inconvenience last mentioned, and also to effect extension by the weight of the body, which is, as it were, suspended from the injured thigh. But, as has been already observed, the muscles are equally tense when the joints of both the knee and hip are bent as when they are extended;

and extension could hardly be obtained by suspending the body from the knee without causing injurious and insufferable pressure on the popliteal vessels. The upper portion of the bone, too, must be influenced by every motion of the patient's body, and accordingly the worst cases of retracted and ununited femur are met with in persons treated by means of the inclined plane, by surgeons whose known reputation precludes the objection that the machine might have been carelessly or unskillfully employed. Even granting that its efficiency were equal to that of the long splint, the simplicity and facility of procuring the latter apparatus would render it preferable. Particular circumstances, however, occasionally occur, which render the inclined plane preferable, such as the existence of a wound, or rigidity of the knee-joint from previous disease, or peculiarities in the direction of the broken surfaces, and therefore every surgeon ought to be provided with it.

The thigh-bone is occasionally fractured through one or other of the condyles into the knee-joint, in which case the best treatment consists in placing the limb straight, in order that the head of the tibia may by its pressure assist in keeping the condyles even, and applying lateral compresses with a bandage.

The thigh-bone is much more frequently fractured through the trochanters and neck, in consequence, generally, of falls on the side. In persons beyond the age of sixty, the neck is broken by a slight degree of force, and may give way alone; but it often happens also that the trochanters are split, while the neck remains entire and is driven into the thick mass of bone at its root like a wedge. The symptoms of fracture in both of these situations are pretty much the same; the limb is shortened from one to two inches, the toes are everted by the weight of the limb, and by the action of the muscles which perform rotation outward, as their attachments to the *trochanter major* remain, while the usual resistance to their operation is removed by the fracture. When rotation is performed, the *trochanter major* may be felt moving as if on its own axis, instead of describing the arc of a circle, as it does when the neck is entire: the shortening of the limb readily yields to moderate extension, and returns when it is discontinued, during which movements an obscure crepitus is generally perceived.

It would appear from some cases that if the fracture splits the trochanters, so as to detach the smaller one from the shaft, and also the posterior part of the greater, to which the muscles that perform rotation outward are attached, leaving the anterior portion of the process which receives the insertion of the *glutæus medius* connected with the body of the bone, the eversion of the limb is prevented, and the toes are turned inward, but in other respects the symptoms are the same.

The discrimination between fracture of the neck alone, and that extending through the trochanters, is not easily accomplished with accuracy. When the patient is not very old, when the shortening of the limb is considerable, and when the trochanter feels, on examination, larger than usual, it may be suspected that the injury is not confined to the neck of the bone. This distinction is of little consequence, except in respect to the prognosis, since the treatment proper for both accidents is the same; but recovery is much more readily accomplished when the fracture is through the trochanters than when it is confined to the neck. In the latter case, most surgeons in this country believe that osseous union is impossible, unless the reflected ligament, or fibrous covering of the neck, which is continuous with the capsule of the joint, remains entire. There is no doubt that the surfaces of the bones are very apt either to continue quite separate, or to be united by a flexible fibrous medium. But none of the arguments which have been adduced to prove the *impossibility* of osseous junction seem to be conclusive; and though the small extent and mobility of the broken surfaces, the absence of vascular tissues surrounding the fracture, and perhaps also the presence of the synovial fluid, may render the cure very difficult, it ought still to be regarded as a possible occurrence. An attempt, therefore, to unite the fracture ought always to be made, and if it fails, the patient will at least have no ground to reflect on the careless treatment of his attendant. The long splint affords the most effectual means of preserving the proper position, but has been objected to on the ground that the pressure on the instep of the foot which its use may occasion is very apt to cause mortification in the old people who are subject to the accident. As extension is not required, there should be little risk of this disagreeable effect; but if it were to appear, the limb ought to be immediately

freed from all restraint, and simply laid over a large pillow or folded bolster, which will tend to prevent displacement of the fractured surfaces. A fibrous connection will then be gradually formed, with more or less shortening of the thigh; and as strength returns, the patient should, by cold affusion and gentle exercise, endeavor to regain the use of the limb. In process of time he becomes able to walk with the assistance of a staff and high-heeled shoe. In fracture through the trochanters osseous reunion is certainly and readily accomplished, provided the limb be kept steady in a proper position; and, judging from my own experience, I should say that the long splint may always be safely employed for this purpose, since it is required merely to prevent motion of the limb.

Of the bones of the fore-arm the radius is most liable to be fractured, and generally gives way about an inch above the wrist. The accident is usually occasioned by falls on the palm of the hand. It is recognized by the ordinary characters of fracture, and is often rendered very obvious by the hand being bent inward, owing to the *pronator radii quadratus* drawing the broken extremities of the bone toward the ulna; or by the distal end of the radius being driven backward so as to make the proximal one project under the integuments of the wrist. When there is little distortion the treatment requires merely the prevention of motion; and this is easily effected by applying a couple of splints and a bandage, which may be a simple roller, as it can be readily changed without deranging the fracture. When the hand is inverted, it has been thought necessary to use some counteracting power, on the same principle as for fractured fibula; but it is found sufficient to apply a couple of wooden splints narrower than the width of the arm, and long enough to reach from the elbow to the fingers, and thus have such a purchase on the hand as may prevent its inversion by the action of the muscles.

The shaft of the ulna also is occasionally broken alone, but not nearly so frequently as the radius. The cause is violence acting directly on the injured part. There is generally little displacement; and the treatment is consequently very easy, requiring merely splints and a bandage.

The olecranon is sometimes broken from the shaft of the bone by falls on the elbow. When the tough ligamentous covering of

the process remains entire, the fragment suffers no displacement, and its lateral mobility is the only indication of the fracture, in addition to pain, swelling, and crepitus. But when this fibrous connection is ruptured, the triceps pulls up the detached olecranon to the distance of an inch or more from its proper place. This fracture, in several important respects, resembles that of the patella and neck of the femur; and, accordingly, like them, is repaired by a fibro-cartilaginous medium instead of bone. With proper care, however, the broken surfaces may be kept so near each other that no inconvenience is experienced on this account. The treatment obviously requires that the limb should be extended, and this is best done by placing a splint on the fore part of the limb, a figure of 8 bandage having been previously applied so as to retain the fragment in its proper position.

Both the bones of the fore-arm are sometimes broken together, but this is a rare occurrence, and happens either from falls on the hand or blows on the arm. The accident is readily recognized, and easily treated through means of a couple of splints, supported by a roller; and if the patient is thin, a longitudinal compress placed between the radius and ulna on both sides of the limb.

The humerus is very liable to fracture in almost every part of its extent; and in respect to the diagnosis and treatment, it is necessary to consider the accident as occurring through the shaft,—through the neck,—and through the condyles.

The shaft is broken most frequently about its middle, between the attachments of the deltoid and *brachiæus internus* muscles. The fracture is usually transverse, and very readily recognized by the flexibility of the limb at the injured part. It is caused by falls, blows, and inordinate actions of the muscles, as in throwing a stone. The treatment consists in applying splints on the inner and outer sides of the arm, extending from the axilla and acromion process to the olecranon, supported by a bandage, which may be a simple roller, or, if there is much swelling, of the looped kind; the elbow ought to be bent at a right angle to relax the muscles equally, and supported in a sling, if the patient is kept out of bed. When the fracture is seated above the insertion of the deltoid, the lower extremity is apt to be drawn so forcibly upward as not to admit of being secured by the means which

have been mentioned. In this case the patient must lie in bed, with the arm separated from the side so as to relax the deltoid, while it is supported by the splints usually required.

The humerus may be fractured at its lower extremity either obliquely or transversely, so as to detach one or both of its condyles. Such accidents are generally caused by falls on the hand or elbow, and though they not unfrequently occur in adults, are particularly common in children, and very apt to be mistaken for dislocation of the fore-arm backward. The transverse fracture may be distinguished by the deformity disappearing on slight extension and returning when the limb is left to itself, but is best detected by extending and bending the fore-arm alternately while one hand embraces the elbow. The oblique fracture is easily recognized if the external and internal tuberosities be pressed backward and forward with the two hands. The treatment of this injury is extremely simple, requiring merely compresses of tow before and behind, and a figure of 8 bandage applied while the bones are carefully held in the proper position, the elbow-joint being afterward kept at a right angle. But the consequences of mistaking the nature of the case, and leaving the limb unsupported after extension has temporarily restored it to proper shape, are most distressing, the arm being always deformed, and generally stiff.

When the fracture occurs above the attachments of the *pectoralis major* and *latissimus dorsi*, it is said to be in the neck of the humerus. In this case the muscles just mentioned draw the lower portion of the bone toward the side, while the *supra-spinatus* and other muscles inserted into the tuberosities cause the upper fragment to project forward and rather outward. This accident happens from falls on the shoulder, and is easily recognized by placing one hand in the axilla while the other subjects the humerus alternately to abduction and adduction. The treatment requires a compress in the axilla to counteract the effect of the *pectoralis major* and *latissimus dorsi*, with a spica bandage to restrain the upper extremity of the bone from being everted, and a sling to support the limb.

The clavicle is frequently fractured by external violence acting directly, and also when transmitted through more or less extent of the superior extremity. The pain, swelling, mobility, and cre-

pitus of the broken part, which is usually about the beginning of the acromial curvature, readily betray the injury, which is rendered still more obvious by the sternal extremity of the bone being drawn upward by the sterno-mastoid muscle, and the shoulder being depressed, brought nearer the sternum, and rendered more prominent forward by the action of the *pectoralis major* and *latissimus dorsi*, assisted by the weight of the limb. In children the displacement is much less observable than in adults, owing to the lightness of their arms, and hence the injury in them is frequently not discovered until the swelling which attends reunion attracts attention.

Great difficulty seems to have been experienced in treating this fracture efficiently; and Desault's method, though complicated and troublesome, was formerly regarded the best for the purpose. It consists of a thick cushion fixed in the axilla, to serve as a fulcrum for removing the shoulder outward to its proper position, by means of the humerus when brought close to the side; a bandage to keep this cushion steady, another to fasten the arm, and a third to elevate the shoulder, by drawing up the affected elbow. But when the cushion in the axilla is secured so high and so firmly as really to serve the office of a fulcrum, it compresses the nerves and blood-vessels beyond endurance; and if it be allowed to descend so as not to do this, it increases the distortion, by separating the arm from the side. The method which, on the whole, appears to be the most simple and efficient, is to brace back the shoulders by a figure of 8 bandage, or shoulder-straps drawn together by any simple contrivance: and having thus obviated the distortion, except so far as regards the depression caused by the weight of the limb, to remedy this also, by placing the affected arm obliquely across the chest, with the fingers pointing to the opposite acromion, and securing it in this position by means of a sling or bandage. In difficult cases the patient should be treated in a horizontal posture, which of course greatly lessens the tendency to displacement.

The scapula may be broken through the acromion process, neck, body, and inferior angle. The first of these fractures is the most common, the others being very rare. It happens from direct violence, occasions nearly the same symptoms as fractured clavicle, but not so well marked, and requires similar treatment. The

neck of the scapula is broken by violence transmitted through the humerus. The symptoms of this fracture are filling up of the axillary cavity by the head of the humerus—a hollow under the acromion process from the bone being out of its place—and easy restoration of the parts to their natural position when the shoulder is gently extended outward; during which adjustment there is usually some crepitus perceived. The treatment required is the same as that recommended for fracture of the neck of the humerus.

The nasal bones, though very thin at their extremity, becoming gradually thicker toward their connection with the *os frontis*, and having a strong support afforded to them by the projecting process of this bone, on which, together with the ascending branches of the superior maxillary, they are firmly placed, suffer fracture less frequently than might be expected from their exposed situation. The fracture, when it does occur, is generally comminuted, and easily recognized by the striking deformity which arises from the flattening and obliquity of the nose necessarily attending it. A great degree of violence being requisite to occasion the injury, there is usually much swelling, which is apt to conceal the displacement of the bones, if the examination be not made immediately after the accident is sustained. Whence it is proper, in all cases where the injury may be suspected, to search very carefully for it, since the inevitable consequence of its being overlooked would be a deformity equally disagreeable and irremediable. The depressed portions of bone may be easily elevated before they become consolidated by the effusion that ensues, and after being pressed up into their proper places by a pair of dressing forceps, or other suitable instrument, generally remain without requiring permanent support. Should they prove not sufficiently steady, a piece of lint ought to be carefully introduced, so as to distend the upper part of the cavity.

The lower jaw, though much exposed to violence by its situation, is comparatively seldom broken, owing to its mobility and strength. The fracture is usually seated in the base of the bone, opposite the bicuspid teeth. It is sometimes confined to one side, sometimes exists in both. It very rarely happens in the ramus, and is hardly ever met with at the symphysis. The nature and seat of the injury are readily recognized, owing to the thinness of

the parts which cover the jaw; and it is generally observed that the portion of the bone next the chin is depressed, partly by its own weight, partly by the action of the muscles which connect it with the *os hyoides*.

The broken surfaces are easily retained in contact by tying up the jaw with a handkerchief or any similar bandage. A pasteboard splint is sometimes applied along the front and sides of the bone, but is in general quite unnecessary. Another contrivance frequently recommended appears, if possible, still less necessary, viz., interposing a piece of wood or cork between the teeth, grooved so as to receive them in a channel both above and below. This is done to restrain motion of the jaw, and afford room for the introduction of nourishment; but the shape of the teeth effectually prevents any lateral movement when they are held together by a bandage, and there are always sufficient interstices between them to admit the entrance of soups or other fluid articles of food, which kind of nutriment alone the patient is of course able to consume, when deprived of the power of mastication. In cases where, owing to the obliquity of the fracture, or any other cause, it is found unusually difficult to maintain the edges of the bone in contact, a thread or silver wire may be tied or twisted round the roots of the adjoining teeth, so as to draw them together; but this expedient should not be resorted to unnecessarily, since it is apt to loosen the teeth concerned.

The ribs are generally broken by direct violence, but also by pressure applied to their extremities, which difference in the cause has been supposed to modify the consequences of the accident; since, when the fracture is caused by direct violence, the rough spicula of bone are projected inward, and readily injure the pleura or lungs; but when the rib is broken by being bent outward by approximation of the sternum to the spine, the parts contained within the chest are less endangered.

The fracture is attended with pain, aggravated by respiration and by obscure crepitus, which is best ascertained by placing the hand on the injured part while the patient breathes. The diagnosis is frequently far from easy, from the patient's inability to bear the necessary examination; but its accuracy is not essential, since the treatment proper for fracture is the same with that required for a bruise of the muscles, the only injury with which it can be

confounded. A broad bandage ought to be applied tightly round the chest, and bleeding, purgatives, and tartrate of antimony must be used according to circumstances.

Fractures of the cranium and vertebræ, being of consequence chiefly on account of their connection with accompanying injuries of the brain and spinal marrow, will be considered most advantageously along with these subjects.

The great strength and arched form of the pelvis enable it to resist all ordinary degrees of violence, and it is only when subjected to the most powerful compression, as from the weight of a loaded carriage or the force of machinery, that the bones composing it give way. They yield most frequently in the horizontal and descending branches of the *os pubis*, and at the same time there is usually a separation of the sacro-iliac synchondrosis on one or both sides. The precise extent of the injury can hardly be ascertained, except by dissection; but the existence of fracture is generally rendered manifest by the pain, mobility, and crepitus which attend it. Sometimes it is made still more obvious by the ramus of the *ischium* or *pubis* being driven through the perineum or the coats of the rectum.

Such fractures are almost certainly fatal, from the great shock of the system and injury of important organs with which they are accompanied; but the patient ought always to be afforded the chance of recovery, by binding the pelvis tightly with a broad circular bandage, and protecting him from excitement of every kind.

The crest of the ilium is occasionally broken by falls and blows; the accident is easily recognized, produces no serious consequences, and requires merely rest, with a spica bandage.

Diastasis or Separation of the Epiphyses.

Before the epiphyses are united to their respective shafts, they may suffer separation from them by such violence as, in the adult, would occasion fracture of the bones concerned, or dislocation of their articulating extremities. The symptoms will resemble those which would result from fracture in the same situation, and the treatment does not in any respect require to be different.

Bending of the Bones.

While the bones are young and flexible, they sometimes bend instead of breaking, when subjected to forces that would occasion fracture in the adult; or rather give way only partially, so that, while altered in form, they still retain some power of resistance. As this accident is not attended with either mobility or crepitus, it is very apt to be overlooked, the distortion of the limb being attributed to swelling of the soft parts, in consequence of the injury. The bones of the fore-arm are most liable to suffer in this way. In order to remove the curvature, and prevent it from permanently deforming and impeding the use of the limb, it is necessary, without loss of time, to employ force sufficient for straightening the bone. If this is done effectually, subsequent mechanical support will hardly be required; but if, from delay, or undecided measures in the first instance, the bones should remain bent, they ought if possible to be straightened by force, and maintained so by rigid splints.

False Joints.

Fractured bones sometimes do not unite firmly together, their extremities being connected by a flexible fibrous medium. The most common examples of this occurrence are afforded by the patella and neck of the femur; but there is hardly any of the long bones in which it may not take place. Its consequences are in general extremely distressing, since the want of due rigidity renders the limbs very imperfect, and sometimes quite useless, for performing their ordinary duties.

The principal cause of this occurrence is unquestionably the want of due fixture, which prevents the fractured extremities from remaining at rest, it being well ascertained that false joints may be certainly produced by subjecting the bones concerned to frequent motion. The best means of prevention are consequently to set the fracture as early as possible, and afterward to retain the bones steadily in their proper places.

Before considering the treatment of false joints, it is necessary to ascertain the nature of the structure which constitutes them.

It is often said to be similar to that of the natural articulations, being composed of two opposite plates of cartilage, a covering of synovial membrane, and a capsular ligament. But in most cases there is merely a tough, fibrous, ligamentous-looking texture, which extends from one extremity of the bone to the other; and the nearest approximation to a new articulation which almost ever occurs, consists in the existence of cavities more or less extensive, between the fibers of this connecting substance.

The best treatment in general is to maintain perfect rest by particularly careful employment of the usual means. Should this not prove sufficient, the plan originally devised by Mr. White of Manchester, in 1760, may be employed. This was to cut down upon the extremities of the bone, and saw them off; after which, the ordinary treatment of compound fracture being employed, the limb regained its firmness, with more or less shortening, according to circumstances. This operation is greatly facilitated by the use of cutting-pliers instead of a saw. It ought not, however, to be performed until the more gentle means have proved unavailing, and unless the patient suffers so much inconvenience from the want of rigidity as to warrant such a severe proceeding. In the humerus and fore-arm the muscles are so equally balanced, that the limb, though quite flexible at the injured part, can sometimes be used for most of the purposes for which it is required. In ununited fracture of the thigh-bone, the limb is always distorted, from the imperfect resistance opposed by the broken bone to the contraction of the muscles, and there thus results an arched form of the thigh. On the convexity of this arch, which is directed outward and forward, a cushion formed of a sheet or table-cloth, folded into the requisite size, is placed, and upon this is made to rest the long splint, which is then drawn tightly toward the knee and pelvis. There is thus not only exerted a constant force, urging the bone into its straight direction, but also the most perfect stability afforded to the fractured surfaces. Within the last few years I have succeeded completely in six cases of ununited fracture of the humerus—some of which were of no less than twelve months' standing—by enveloping the whole limb, from the scapula to the finger-points, in a firm starch and pasteboard case, which was prepared before the operation of excising the ends of the bone,

taken off at the time of its performance, and reapplied when the wound had nearly healed.

Inflammation of Bone.

Inflammation of the periosteum, and that of the bone itself, frequently occur together, give rise to similar symptoms, and require nearly the same treatment. The former, or Periostitis, is characterized by deep-seated aching pain, and thickening of the integuments, which adhere to the part affected. These symptoms vary much in the degree of their acuteness, and are accordingly accompanied with more or less constitutional derangement. The disease frequently becomes periodically aggravated, and is apt to be increased by all sorts of excitement. It is usually most severe during the night, and after meals. The periosteum is most liable to inflammation where it covers bones near the surface of the body, as the shin-bone, the skull-cap, the clavicle, and sternum.

In the chronic form of the disease, it is generally possible to trace the operation of a predisposing as well as of an exciting cause. The former seems to consist in derangement of the system from various circumstances, but most frequently from the prejudicial use of mercury co-operating with venereal disease, especially in a scrofulous constitution. The latter includes exposure to cold and wet, and blows. Middle-aged adults are the most common subjects of its attacks.

The mode of treatment depends upon the intensity of the symptoms. When they are very violent, and attended with smart fever, the most effectual practice is to make a free incision through the inflamed parts down to the bone. When less severe, they yield to leeching or cupping, warm anodyne fomentations, camphorated mercurial ointment with anodyne liniment, and opium administered internally along with calomel, ipecacuan, tartrate of antimony, or colchicum. When still more chronic, they require repeated blistering, with an alterative course of the hydriodate of potass, or the oxymuriate of mercury—six grains of the former, or half a grain of the latter, being given daily in divided doses. The decoction of sarsaparilla is generally prescribed, but I believe without any beneficial effect, farther than

inducing the patient to conform to dietetic rule. The formation of matter is a very common consequence of chronic periostitis, but, in this case, absorption may generally be induced by using the means just mentioned; and, therefore, an opening of the cavity ought to be avoided. Should it take place spontaneously, moist dressing, with occasional blisters, will be found the best means of treatment.

Inflammation of the substance of the bone occurs under similar circumstances, and is attended with nearly the same symptoms. The pain is, if possible, still more deep, dull, and aching; the integuments, though exhibiting the same changes in the progress of the disease, are not so much altered in the first instance, and the swelling affects the shape of the bone more extensively. When acute, it generally terminates in death of the dense osseous tissue, and in suppuration of the spongy bone. When chronic, it expands the texture of the shafts, so as to make them larger and less compact, and in the cancellated texture usually induces either absorption or suppuration.

The treatment is to be conducted on the same principles as that of periostitis. When the inflammation is acute, it terminates very speedily in absorption, suppuration, or death of the part affected, and seems to be hardly influenced by any remedial measure. But when chronic, it is more under control, yielding in the dense bones to blisters, employed along with alterative medicines, and in the spongy bones to the actual cautery. The swellings which are occasioned, both by chronic periostitis and inflammation of the bone itself, are called Nodes.

Necrosis.

The expression Necrosis has been employed to denote different morbid affections of the osseous tissue, and has consequently given rise to much confusion. It literally implies merely the deprivation of life, but has been understood to denote also the consequent reproduction of new osseous substance.

All the bones are liable to necrosis, but those which possess a dense texture are more subject to it than the spongy ones. The causes of necrosis are various. It was formerly believed that the mere removal of the periosteum certainly caused the death of a

scale of the bone more or less thick, by depriving it of nourishment, and hence it was a rule, with the old surgeons, to hasten exfoliation in all such cases by applying the actual or potential cautery. But it is now ascertained that simply removing the periosteum does not necessarily cause exfoliation, and that when a bone throws off a scale, after being so exposed, it generally does so in consequence of the injury which it has sustained from the violence that occasioned the separation of the membrane. Blows, falls, strains, and exposure to cold, are the causes that most frequently give rise to necrosis, and they act either directly, by at once destroying the vitality of the part affected, or indirectly, by exciting inflammation, which terminates in the death of the bone. The inflammation, when acute, is not confined to the bone, but generally affects all the superjacent tissues; whence it has been erroneously supposed, from redness of the skin being present, that erysipelas or inflammation of the skin may induce necrosis. There often seems to be a constitutional proneness to necrosis, so that many bones of the same person die together or successively. This disposition exists most frequently in childhood, and is almost always associated with, perhaps dependent upon, weakness of the system.

The dead portion appears as if it had been long and carefully macerated, being hard, white, brittle, and sonorous when struck with a probe. If exposed to the air previous to separation, it suffers various alterations of color, and generally, in part at least, becomes black; but this depends upon the discharge of the sore and the action of the air. It is named an Exfoliation, and gradually separates from the living bone by ulcerative absorption. The circumstances which attend the process of exfoliation and its reparation vary much, accordingly as it affects the external surface, internal surface, or the whole thickness of the bone concerned.

External Exfoliaton.—The external surface of bones being most exposed to those injuries which cause exfoliation either directly by their violence, or indirectly by exciting inflammation, most frequently suffers from it; and, of the particular bones, those nearest the surface of the body, as the tibia and cranium, are, as might be expected, more especially liable. The separation of the dead portion being effected by a process of the living system,

does not admit of any assistance from the surgeon, whose interference could hardly fail to do harm by injuring the adjoining sound bone. Free vent ought to be afforded by proper incisions to the matter, which is copiously secreted; and the exfoliation should be examined from time to time with the probe, to ascertain whether or not it has become detached. So soon as it is found to be loose, it ought to be removed by means of forceps, either through the opening which already exists in the integuments, or a suitable extension of it. The remaining surface granulates, and osseous matter is effused under the pellicle, so as to fill up the breach partially, but usually leaving a permanent depression at the part.

Internal Exfoliation.—It is of course only in the cylindrical bones that exfoliation from an internal surface can take place; and those of the largest size are most frequently the seat of it. The cause is almost always inflammation, since the injuries which directly occasion necrosis can rarely operate on the interior of a bone. The exfoliation in this situation is named a *sequestrum*. It separates from the sound bone as in the former case; but having done so, cannot escape through the walls of the shaft within which it is inclosed, and therefore remains a source of irritation. The living bone, in consequence, becomes greatly thickened, and new osseous matter is copiously effused from its external surface, in the form of irregular projecting tubercles.

At the same time the pus, which is pent up within the cavity, by its pressure on the parietes, induces absorption, and the formation of cylindrical apertures through the shell of the bone. These *cloacæ*, as they are named, allow the confined matter to escape, and present itself under the integuments in the form of an abscess, which, if not opened by the surgeon, sooner or later evacuates its contents by ulceration. Thus far, during the process, the patient suffers from pain and swelling of the limb, but after the matter obtains free vent, he finds himself greatly relieved. The enlargement, though it does not disappear altogether, subsides very much, and so little uneasiness remains that he is generally able to make some use of the limb. If it should fortunately happen that the sequestrum is not only small, but also favorably situated for escaping through a cloaca, the source of irritation being thus removed, the patient may be restored to health. But

if the sequestra do not pass out spontaneously, the surgeon, having ascertained their presence by the probe, must enlarge the opening which leads into the cavity containing them, so as to obtain space sufficient for their extraction. In order to do this, he makes a simple, or, if the part admits of it, a crucial incision through the integuments, having the cloaca for its center, dissects back the flaps, and applies the trephine over the opening should there be room for doing so, and if not, as is usually the case, he employs the cutting-pliers to enlarge the opening sufficiently. The process of extraction may sometimes be facilitated by dividing the sequestrum into pieces.

Exfoliations of the whole Thickness.—Bones die throughout their whole thickness from causes similar to those which induce exfoliation of their external or internal surface, and the dead portion separates from the living by the same process of absorption that occurs in such cases; but the state of the bones, after the cure is completed, requires in this case particular consideration. Sometimes the place of the dead part is not at all, or very imperfectly, supplied; at other times its separation could hardly be suspected from any change visible in the shape or size of the bone affected. In order to account for this remarkable difference, it is necessary to inquire into the circumstances of the cases in which it is exhibited.

In some cases, when the dead bone is detached, the remaining surface merely granulates, just as after the separation of an exfoliation which extends only partially through the whole thickness, and effuses sufficient osseous matter to round off the edges, thus lessening the extent of the gap, but still leaving a permanent deficiency at the part. The same result ensues when a portion of bone, including its whole thickness, is removed mechanically. But at other times the dead portion is found to be contained within a more or less complete case of new bone, which is ready to take the place of the old one whenever it is removed, by contracting its sides together so as to become a solid mass.

It was formerly supposed that the death and reproduction of an entire shaft, in this way, was a very common event, all cases of internal exfoliation being regarded as instances of its occurrence, and the expression Necrosis has been generally employed to denote this remarkable process. It might have been supposed that when

only small sequestra made their appearance, or were found on dissection, decisive proof would have been afforded of the partial extent of the disease. But the general swelling of the limb, which is caused by the irritation of an internal exfoliation, having led to the erroneous belief that an entire new shell was forming about the old bone, the non-appearance of a sequestrum adequate to the supposed extent of destruction, was accounted for by attributing its diminution or removal to the absorbing power of the vessels or the solvent property of the pus. It is now well ascertained that the sequestrum cannot be acted upon in either of these ways; and that its size may, therefore, be safely taken as a measure of the extent to which the bone has died. According to this test, it is found that the death and regeneration of an entire shaft, so far from being a very common occurrence, is an extremely rare one; and some pathologists, as Leveillé, have gone so far as to deny it altogether, alleging that more or less of the external part of the old bone always remains, and becomes expanded into the new shell. There can be no doubt, however, judging from the size, shape, and smooth surface of the sequestrum, that it sometimes, though certainly very seldom, comprehends the whole thickness and circumference of the shaft.

The origin of the substitute in cases of this kind has been variously explained. It must evidently proceed—1. From granulating action of the portion that remains. 2. From the old bone previous to its death. Or, 3. From ossification of the periosteum or other surrounding tissues. The first of these opinions has been supported by Richerand and others, who regard as strongly in their favor the fact that more or less of the old shaft, and at all events the epiphysis, always remains. But in external exfoliations the granulating action seldom if ever fills up the breach; and when a considerable portion of the whole thickness of a bone is destroyed suddenly by inflammation, or is removed by mechanical means, the loss of substance is in general not fully restored, which it ought to be according to this view of the matter. In cases where no permanent deficiency remains after the separation of the dead bone, it is generally noticed that the limb becomes enlarged previously to this event; and experiments on the lower animals, as well as observations of what happens in the human body, have been thought to show that the new shell may begin to be formed

before the death of the old shaft. Dr. Macdonald remarked (1799) that the new bone, when first formed, adhered inseparably to the old one; and the late Professor Russell injected the vessels of the old shaft, while its substitute was in progress of formation. It has hence been concluded, that the ossifying process originates from the old bone; and that unless the foundation of a new one be laid by it, previously to its own death, the loss of substance will not be replaced. But it has been fully ascertained, as well by experiment in the lower animals as from observation of disease in the human body, that a bone, though suddenly deprived of life, may still be reproduced; and, on the whole, it seems clearly established, that the periosteum must be regarded the main source of reproduction. The views which I entertain on this subject will best appear from the following extract from the *Transactions of the Royal Society of Edinburgh.**

"The property of forming new bone was first attributed to the periosteum by Duhamel, about a hundred years ago. Having been engaged in the study of vegetable physiology, and more particularly in regard to the formation of wood, he imagined that there might be an analogy between the inner layer of the bark and the periosteum, and that as the former hardens in successive layers so as to constitute the wood, the latter might suffer a corresponding conversion into bone. He supported this opinion by the following arguments: 1. That when bones are burned in the fire, or exposed to the weather, they separate into a number of thin plates. 2. That, in consequence of disease arising from external violence, the bones frequently throw off thin scales, or exfoliations as they are called. 3. That when animals are fed alternately with madder and without it, their bones exhibit alternate layers of a red and white color; and, 4. That when bones are fractured, they unite by means of an osseous capsule formed externally to, and embracing the broken extremities, just as the branch of a tree acquires strength after being grafted, or simply broken across.

"This theory of Duhamel was strenuously opposed by Haller, who urged, as altogether inconsistent with it, the mode in which bones are originally formed. He carefully investigated the pro-

* Vol. xiv. 1837.

cess of ossification during incubation, and detailed the steps of its progress in the chick as well as other young animals. The rudiment of the future bone being traced from its earliest distinguishable appearance, was found first to present the characters of a jelly; then to acquire the consistence of cartilage or gristle; and finally to reach the perfect osseous state: whence it was contended, that a structure which thus originated in a distinct form, and independently of any other, could not owe its increase afterward to a different source. Haller also engaged his pupils Detlef and Boehmer in extensive series of experiments, by breaking the bones of animals, and feeding them with madder during their recovery; from the results of which he inferred that Duhamel had been mistaken in supposing that fractures are reunited by ossification of the periosteum.

"Notwithstanding these objections, and the authority of the physiologist from whom they proceeded, the doctrine of Duhamel still maintained its ground; and not long afterward—viz., in the year 1780—derived a great accession of strength from the experiments of Troja, who, by destroying the marrow of bones, caused their death, and the formation of new shells surrounding them, apparently from ossification of the periosteum. This experiment, which Troja himself performed some hundreds of times, when repeated and varied by the pathologists of almost every country, seemed to confirm the ossific power attributed to the periosteum beyond question, until Scarpa, the distinguished Professor of Pavia, again investigated the grounds on which it was originally founded by Duhamel. In Scarpa's treatise, 'De Penitiori Ossium Structura,' which was published in 1799, he explained that the foliated appearance, presented by bones that had been burnt, did not depend upon the development of a structure naturally belonging to them, but was an effect produced by the unequal action of the fire; and that the separation of scales from diseased bones was no stronger proof of their possessing a laminated structure, since thin and broad portions of dead substance are wont to be detached from the skin and other soft textures, in which it was never supposed that layers existed naturally. He recalled attention to the synthetic experiments of Haller, who, by investigating the formation of bone from the earliest stage to its perfect state, had established the reticulated nature of its texture;

and by an opposite process of an analytic kind, which consisted in depriving bones of their earthy constituent by means of diluted acids, and then macerating them for a long while in water, he unraveled the texture so as to show that it really was reticular. As a consequence of these observations, Scarpa denied that bone could be formed by the periosteum; and this opinion was keenly embraced by several pathologists of the present century, and particularly by the French surgeon Leveillé.

"At present, professional opinion is divided in regard to the ossific power of the periosteum, and different sides of the question are maintained by teachers and writers in this as well as other schools of medicine. As the point in dispute is not merely a matter of curiosity, but one of great practical importance, it is very desirable that the truth should be ascertained. It would detain the Society too long were I to show how the different opinions on this subject may influence the practice of surgery; and I shall, therefore, proceed to state the considerations which have completely satisfied my own mind, and are, I think, sufficient to satisfy any one who is open to conviction, that though Duhamel was misled into many errors by the false analogy which he supposed to exist between wood and bone—in regard to the mode of their natural formation—the periosteum, nevertheless, does possess the power of producing new osseous substance in certain conditions of disease.

"The well-known and often-repeated experiment of Troja, which consisted in perforating the cavity and destroying the marrow of a bone, so as to kill it and cause the formation of a substitute in the form of a shell surrounding the old one, was devised in imitation of a process which not unfreqently occurs spontaneously in the human body. In this disease, which has been named Necrosis, a portion of the old bone dies, and becomes surrounded by a new one. The new shell is of a larger size and more irregular form than the old one, which may be seen through a number of circular apertures lying a prisoner within this structure, intended by Nature to serve as a substitute for it. Those who deny the ossific power of the periosteum maintain, that in all such cases, whether resulting from injury purposely inflicted with the view of experiment, or proceeding from diseased action, a portion of the old bone remains alive, and serves as the germ of

a new one; that, in short, the formation of the new bone is simply an expansion or growth from the remnant of the old one, and that if merely the extremities of the bone affected remain alive, they will prove sufficient for generating the substitute shell.

"It is difficult to reconcile this explanation with the rapid growth and uniform thickness of the new bone; since, if its formation proceeded from the extremities, the process should be slow and progressive toward the center; but there is another objection still more conclusive against it. If the new bone is formed by a portion of the old one that remains alive, then the removal of a part by mechanical means should be supplied from the same source. But in all the cases where this has been done, either in the way of experiment, or for the cure of disease, the loss of substance, unless of small extent, has been found imperfectly repaired. For instance, after the operation of trepanning the skull, the aperture in the bone, though it becomes diminished in extent, is not altogether obliterated, and the newly-formed bone is not only smaller than the portion removed, but also thinner.

"In the fore-legs of dogs and rabbits there are two bones of nearly equal size, and so connected, that a large portion of one may be taken away without destroying the rigidity of the limb. There is here, therefore, a convenient opportunity of trying what can be done by the extremities of a bone for restoring losses of substance in the shaft. Experiments of this kind have, accordingly, been frequently performed on these animals, and the result has uniformly been, that when the portion removed exceeded an inch in length, there was a permanent deficiency of osseous substance, the ends of the bone being merely produced toward each other in a conical form, and connected together by a tough ligamentous texture. Sir A. Cooper has given representations of the results he met with; and I have met with others precisely similar.

"Some of those pathologists who deny the ossific power of the periosteum, and claim the whole production of new osseous substance for the bone itself, have attempted to explain away the difficulties which have just been stated, by supposing that, in cases of necrosis where a new bone is formed, the old one, in consequence of the increased action preceding its death, may determine the effusion of organizable matter into the surrounding

soft textures, which will serve as a matrix or foundation for the new shell, and be ready to take up the ossifying process so soon as it is communicated from the surviving extremities of the bone. That the process of reproduction may be accomplished in this way I am not prepared to deny, but that it is not necessarily, or always so performed, will, I think, appear from the following case:

"A girl, twelve years of age, strained her ankle in the month of March, 1835. Inflammation followed, extending up to the knee, and attended with violent fever. She was brought to the hospital and placed under my care. Incisions were soon afterward made to evacuate a large collection of matter which had formed in the leg; and the bone being found dead, while the patient's strength was rapidly giving way, I amputated the limb above the knee five weeks after the injury had been received. The girl recovered, and is now well. In examining the limb to ascertain the extent to which the bone had died, I found that it was partially surrounded by the commencement of a new one. The shell had already acquired considerable firmness at some parts, but was not equally thick throughout, and did not seem fixed to the ends of the old shaft. This observation led to a very careful dissection of the parts concerned; and they are now before the Society. It will be seen that the tibia had died very nearly from end to end, and that the new shell inclosing it has been formed in the periosteum. The new osseous substance may be observed at some parts in the form of small distinct scales. At other parts it looked as if it had originally consisted of separate portions, and been composed by their union. The periosteum connecting these portions to each other and to the extremities of the bone was not thickened beyond its natural condition; and where it covered the posterior surface of the tibia, though quite detached from the old bone, had not suffered any further change. It also appeared that at those parts where the periosteum was absent, no new bone had been formed, so that the *cloacæ* would have been formed by these defective portions, and not by absorption, as was supposed to be always the case.

"There is here, then, an instance of a bone dying suddenly in consequence of acute inflammation, without any thickening previously formed in its neighborhood, and nevertheless succeeded by the production of a new osseous shell, which evidently could

not proceed from the old bone, and no less evidently depended upon an ossific process resident in the periosteum.

"As Nature is not capricious or variable in her proceedings, I regard this case as sufficient of itself, without any further evidence, to establish the ossific power of the periosteum. But, with the view of making the matter still more clear, I performed the following experiments. I exposed the radius of a dog, and removed an inch and three-quarters of it together with the periosteum. At the same time I exposed the radius of the other leg, and removed a corresponding portion *without* the periosteum, which was carefully detached from it and left quite entire, except where slit open in front. Six weeks afterward the dog was killed, and the bones examined. In the one from which a portion had been taken together with the periosteum, the extremities were found extended toward each other in a conical form, with a great deficiency of bone between them, and in its place merely a small band of tough ligamentous texture. In the other, where the periosteum had been allowed to remain, there was a compact mass of bone not only occupying the space left by the portion removed, but rather exceeding it in thickness. This experiment, when repeated, afforded the same results.

"I next exposed the radius of another dog, and separated the periosteum from the bone as in the former experiment; but then, instead of cutting out the denuded bone, inserted a thin plate of metal between it and the periosteum. The edges of the membrane, and then those of the skin, were sewed together, and the wound healed kindly. At the end of six weeks I dissected the limb, and found a deposition of osseous substance in the periosteum, forming a bony plate exterior to the metal, and not connected with the old bone except by the membrane.

"I lastly exposed the radius of a dog, and cut away the periosteum to the same extent that it had been merely detached in the experiment just mentioned, and surrounded the denuded bone with a piece of metal. At the end of six weeks I found a thick tough capsule formed, inclosing the metallic plate, but having no osseous substance in it.

"The evidence which has now been adduced seems to me sufficient for putting beyond all question the power of the periosteum to form new bone, independently of any assistance from the old

one. I submit it, with deference, to the Society, in the hope that those members who have directed their attention to the subject will give it their dispassionate consideration, and either admit the opinion which it supports, or show the fallacy by which it has misled."

The treatment of necrosis seldom admits of active measures on the part of the surgeon at its early stage. Abscesses should be opened when they point. Sequestra ought to be assisted to escape, and the patient's strength supported by nourishing diet and the other usual means. If the death of the bone is so sudden and extensive that the new shell is not able, in the first instance, to support the strain of the muscles and weight of the limb, splints must be carefully employed until the process of ossification is advanced far enough to render them unnecessary. Finally, in case the patient proves unable to bear the long-continued and exhausting exertion requisite for accomplishing the cure, he ought to be relieved by amputation.

Suppuration of Bone and Caries.

It is only in the cancellated or spongy texture of bone that inflammation induces suppuration; the dense parts never taking it on unless they are previously expanded and loosened, in consequence of chronic inflammation. In the cancellated texture suppuration is frequently preceded by scrofulous deposition.

The matter may be collected either on the external surface, or in the interior of the bone. In both cases there is more or less excavation, effected by absorption of the bone concerned; and in the latter not only this effect ensues, but also an enlargement of the external shell of the bone, which thus forms an expansion, constituting what is called *spina ventosa*.

The most remarkable example of osseous expansion from the formation of matter with which I am acquainted, is a preparation in the Museum of the College of Surgeons of Edinburgh. It resulted from fracture of the tibia, and existed, progressively increasing, for many years, during which the patient was enabled to discharge the duties of an active life, by closing the orifice with a cork, which he removed from time to time when he found a convenient opportunity for pouring out the accumulated fluid.

The cavities which are formed in the cancellated substance of bones, especially in those cases where there has been a previous infiltration of scrofulous formation, frequently contain loose portions of the spongy bone, which have been deprived of vitality by the inflammation. When the matter escapes from a hollow of the bone by causing absorption of its sides, or when it is formed, in the first instance, exterior to it, the integuments are elevated, and at length give way, with great relief from the pain which was previously suffered. The abscess may then heal, like an ordinary one of the soft parts, or prove very obstinate, or permanently resist all means of cure. It is impossible to foretell positively which of these events will ensue, but experience and attention to the following circumstances generally enable the surgeon to form a pretty accurate opinion as to the result: 1. If the patient possesses a good constitution, and suppuration in the bone has been induced in consequence of inflammation caused by severe external violence, such as the wound of a joint, the prognosis may be favorable. 2. If the patient possesses a bad constitution, and the primary inflammation has commenced without any external cause, or one comparatively so slight as a bruise or a strain, which of itself is evidence of his constitution being unsound, the disease will probably be obstinate or incurable. 3. If the patient is an infant or child, and especially if he suffers from suppuration of several bones at the same time, there is a good prospect of an ultimate cure, but not without a very tedious process of recovery. 4. If the suppuration takes place in a bone that naturally possesses a dense texture, but which has been opened out by previous disease, it generally admits of cure more readily than when seated in one originally cancellated. Sir B. Brodie has directed attention to abscesses forming in the cancellated texture of bones, but more especially the tibia, and remaining latent for an unlimited duration of months or years, the chief symptoms being enlargement of the bone, with thickening of the soft parts, and deep-seated pain. In such cases he advises the employment of a trephine to evacuate the matter; and this practice has been adopted with advantage. But the operation must not be resorted to without the greatest caution, since chronic periostitis is extremely apt to simulate the condition requiring its performance, and has misled practitioners, even of the most extensive experience, to trepan

unnecessarily, with effects not less disastrous than even the death of the patient.

Whatever be the opinion entertained of the probable result of the case, after the matter has been evacuated, it ought always at first to be treated as if the sore were expected to heal. Free openings should be afforded to the discharge; stimulating washes, with moderate pressure afterward applied; and the patient's general health carefully preserved. When the ulcer of the bone resists all means of cure, it constitutes what is called Caries.

The distinguishing character of caries is obstinacy of the disease. The local symptoms vary considerably as to the quantity and quality of the discharge, the degree of pain, and the appearance of the orifice. The matter is generally thin and fetid, but sometimes possesses all the properties of perfect pus; the pain for the most part is gnawing and incessant, but often is hardly perceptible, or on the contrary extremely severe. The orifice is usually small and callous, but occasionally exhibits large and flabby granulations. The disease has for the most part remissions more or less complete, and of considerable duration, in which the pain and discharge nearly or altogether cease, and the ulcer seems to be on the point of healing, or actually becomes covered with a cicatrix, which, however, is always thin and soft. But these amendments are only partial and temporary, being always followed by relapse, and there is no natural limit to the duration of the disease except the life of the patient, who, after months, or even many years of suffering, becomes finally exhausted, either by the caries itself, or some other disorder which the irritation produced by it has excited. When a carious bone has been macerated, the diseased part is found excavated and rough, the cancellated texture being remarkably spicular, white, and brittle, so as to resemble a spongy bone which has been exposed to the action of fire. The surface thus affected is often of considerable extent, though frequently very small, even in cases of old standing, but the disease seldom reaches to a considerable depth. The field of the disease seems to be determined by the primary inflammation, and after being thus established, has little or no tendency to become larger. Around the carious part there is always an effusion of new osseous matter in the form of spines or tubercles, extending to a considerable distance, and greatly increasing the thickness of

the bone. This new mass, which is no doubt produced in consequence of the irritation of the disease, like that formed to reunite fractures and supply the place of exfoliations, is characterized by compactness and smoothness when minutely examined, though on superficial inspection it appears rough and porous. The pores are apertures for the transmission of blood-vessels, but their form is circular and their edges rounded off, so that sharp edges cannot anywhere be perceived. The newly-effused bone may thus be readily distinguished from the diseased part, to the irritation of which it owes its origin. It is necessary also to distinguish between caries, and the excavation of the cancellated texture which is caused by absorption owing to pressure. In this case the bone presents the same appearance that it would do if its external crust were removed by mechanical means; and it possesses none of the whiteness, brittleness, or spicular surface observed in caries. As this difference can hardly be ascertained until after maceration, a more useful distinction is afforded by the history of the case, and whenever the excavation is plainly referable to pressure, no apprehension need be entertained of caries. It is thought by many that deep-seated collections of matter, if not evacuated early, may occasion caries; but when this morbid state of the bone is connected with deep suppuration, it will always be found to have been the direct result of the primary inflammation. That mere pressure is not sufficient to produce caries, may be learned from the want of any morbid disposition in the sides of the apertures which are formed by absorption to evacuate matter confined in the cavities of bones. In the living body the carious surface is generally more or less completely covered with unhealthy granulations, which often possess very considerable firmness, and render the discovery of its extent, or even existence, by no means easy. The disease occurs at all ages, but commences most frequently in the early periods of life. It is most frequently met with in persons disposed to scrofulous action, and often follows suppuration in bones which have been the seat of deposits proceeding from that morbid disposition.

The treatment of caries is to be conducted on the same principles as that of cancer, and consists in the use of means which have the effect either of destroying the life of the morbid part, or of removing it at once from the system. There is this difference, how-

ever, that there being no malignant tendency to take on the same diseased action in the neighboring parts, it is not necessary to remove any of them, except in order to gain access to the seat of the evil. Notwithstanding this favorable circumstance, it is found extremely difficult to eradicate the disease by depriving the part affected of its vitality. The bone usually lies at a considerable depth; the caries, though it seldom penetrates deeply into its substance, generally occupies an extensive and irregular surface; and the effect of agents used with the view of killing the morbid part is necessarily much weakened by its humidity. The concentrated mineral acids—the nitrates of silver and mercury—the red oxide of mercury—and the actual cautery, are considered the best means for the purpose. In using them the bone affected ought to be very freely exposed by a crucial incision, and then dried as well as possible, after which the caustic or cautery selected should be applied so as to produce a decided effect. The fluid caustics should be applied by means of a piece of lint soaked in them; the solid ones should be rubbed on the part, or, if they are in the form of a powder, as the red oxide of mercury, laid on it in substance; the cautery should be of a spherical or ovate shape, it must be pressed down firmly, and be succeeded by two or three others until the whole morbid surface has been subjected completely to their action. The effect of all these applications, however carefully employed, is very superficial, and it is extremely difficult, if not impossible, to insure their operation on the whole surface of the diseased part. They, therefore, frequently require to be repeated, and generally prove inadequate to destroy the disease, unless it is very limited and accessible; and it is even not improbable that some of them, as the actual cautery, may occasionally make the matter worse, and extend the disease to the neighboring bone by exciting inflammation in it. For these reasons excision ought to be preferred to caustics for removing the carious bone; and if the part affected be within reach, which can always be ascertained previous to commencing the operation, it may by this method be surely and thoroughly eradicated at once. If the disease is superficial, and of small extent, it is easily scooped out with a gouge, the toughness and compactness of the sound bone distinguishing it from the morbid portion. If extensive and deeply seated, it is best removed by taking away the whole of the articulating ex-

tremities concerned, as will be explained hereafter when the diseases of the joints are considered. When the situation of the caries prevents it from being cut out, amputation ought, if possible, to be performed; and if this be impracticable, the disease will sooner or later prove inevitably fatal.

Exostosis.

The term Exostosis is employed to denote various morbid conditions of the osseous system differing materially from each other, and has consequently occasioned great confusion. In order to avoid this, it ought to be confined in its meaning to imply an unnatural growth of bone. Exostosis in this sense exhibits three remarkable varieties in respect of its structure; being sometimes solid, at other times hollow, and also not unfrequently spicular or foliated—that is, composed of radiating points or plates. The first of these kinds of exostosis exists independently of any other disease, but the two others are connected with, and dependent upon, different morbid formations, along with which they may more properly be considered.

The first, which may be called the simple or solid exostosis, consists of a mass of osseous substance growing out of a bone naturally belonging to the skeleton. It is sometimes thin and flat, rising gradually from the surrounding surface, and not causing any sharp projection, when it is named a Node—an appellation which is also used to designate a similar swelling dependent on chronic thickening of the periosteum. In other cases it forms a projecting excrescence, the neck of which is usually narrow in proportion to the extremity. The substance composing such excrescences is of various solidity, being sometimes open and spongy, at others more dense and compact. The bones most frequently thus affected are the femur, tibia, humerus, and distal phalanx of the great toe. It may appear at any age, but, for the most part, does so about the time of puberty.

The inconvenience which this sort of exostosis occasions depends very much upon its situation. Generally while the growth is enlarging, pain and annoyance are experienced from obstructed function of the neighboring parts; but when it ceases to increase and becomes dense, which it usually does sooner or later, the irri-

tation of its presence becoming habitual, is no longer troublesome. The treatment, therefore, seldom requires to be active; and nothing more is usually requisite than to protect the limb, or part affected, from the irritation of motion or pressure, so long as the exostosis is enlarging. Should it prove permanently or seriously troublesome, excision affords easy and effectual means of relief. For this purpose many ingenious contrivances have been recommended, but nothing answers so well as the cutting-pliers. It has been thought necessary to perform amputation of the great toe on account of the exostoses which are apt to grow at the side or extremity of the nail; but this proceeding is equally severe and unnecessary, as excision of the tumor may be easily effected, and is not followed by relapse. The reason of this appears to be that the ossifying process proceeds not from the root but from the surface of the growth—which is covered by a layer of fibro-cartilage or cartilaginous substance, and in some situations with the addition of an investing bag, like the synovial membrane. This condition greatly facilitates removal, by insulating the exostosis from surrounding parts, and affording access to its point of attachment. It also occasionally embarrasses the diagnosis by becoming the seat of serous effusion.

The hollow exostosis depends on the expansive effect of fluid or solid formations within the bone; and the osseous substance may be regarded as devoid of any morbid disposition, so that if the contents could be removed it would contract to its ordinary dimensions. The same observations apply to the spicular or foliated exostosis, which is always found connected with some source of irritation, and is to be looked upon rather as a consequence than a part of the disease.

Fibro-Cartilaginous Tumor of Bone.

It is usual to comprehend all the solid tumors of bones, the consistence of which is less hard than that of the bone itself, under the title of Osteo-sarcoma. But as this leads to much confusion, it is better to divide the softer tumors of bone into the fibro-cartilaginous and medullary-sarcomatous, which differ essentially in their nature and consequences.

The fibro-cartilaginous tumor, when occurring in bones, pos-

sesses the characters which have been already described in the general account of this kind of morbid growth. Its color is white, gray, or yellow; its consistence more or less nearly approaches that of cartilage, and it often has interspersed through it small cysts of transparent fluid. It generally originates in the central part of the bone affected, and, gradually enlarging, expands the surrounding shell, which still preserves the properties of sound osseous tissue, though sometimes singularly altered in shape. The tumor is productive of little inconvenience except from its size, but on this account is often a source of great annoyance and distress; as when the lower jaw, humerus, metacarpal bones, or phalanges of the fingers are affected. There is reason to believe that if the fibro-cartilaginous substance could be completely eradicated, the bone would resume its natural shape and size; but as its cellular or honeycomb-looking structure, when expanded by the disease, renders this impracticable, the only remedy is removal of the bone affected, which, however disagreeable in some situations, from the deformity occasioned by it, may at least be performed with a favorable prospect of effecting a permanent cure.

Medullary-Sarcomatous Tumor of Bone.

Medullary sarcoma occurs in bone perhaps more frequently than in any other tissue of the body. It commences sometimes immediately under the periosteum, and causes an excavation in the surface of the bone, around which more or less osseous matter is effused; at other times it begins in the interior, springing apparently from the medullary membrane, and then expands the bone into a shell, or, by inducing absorption, causes a perforation, through which it issues and swells into an external tumor; or it opens out the bone into needles or plate-like processes radiating from the central seat of the disease; or lastly, it may simply occupy the place of the bone. But, whatever may be the diversity in this respect, the morbid degeneration always exhibits its characteristic features. There is usually great pain from the first, and often for a long while, before any external swelling is visible. The patient loses flesh, and indicates, by his anxious expression of countenance, the presence of a malignant disease.

The tumor, though at first seldom so soft as when originating in the less dense tissues of the body, in its progress becomes softened, and acquires, at least in some parts of its extent, a consistence so nearly approaching that of a fluid as to render the discrimination from it extremely difficult. Then the veins enlarge—the integuments inflame—ulceration ensues—fungous excrescences protrude—and the patient sinks under the exhaustion which results from profuse discharge of ill-conditioned matter or blood. The disease makes its attack at every time of life, and in both sexes; but seems, on the whole, most frequent between twenty and forty years of age. The only remedy is amputation; and unless this be performed early, before the constitution of the patient is much injured, and freely, so as to remove the whole of the affected bone, it will in all probability prove of little permanent benefit.

Cystic Tumor of Bone.

The bones sometimes, but very rarely, with exception of the upper and lower jaw, become the seat of cystic formations. The swelling is generally not attended with much pain, and at its commencement may be mistaken for a solid exostosis or cartilaginous growth; but as the cysts enlarge and approach the surface, the thinness of their parietes betrays the nature of the case. This disease occurs most frequently in the earlier periods of adult age. So long as it retains the characters of the cystic tumors, it may be regarded as free from any malignant action; but this morbid structure sometimes changes into medullary sarcoma. The best mode of treatment is early and free removal of the bone affected, if puncturing the tumor, or laying it open by free incision, has not the effect of curing the disease.

Rachitis or Rickets.

By Rickets is understood a morbid state of the osseous system, in which the bones are soft and flexible, being converted into a substance more like leather than bone; having a brown color and cartilaginous consistence, with no appearance of marrow, but numerous irregularly circular and oval cells, even in the parts naturally most compact, containing a brownish-red fluid. The

disease does not directly cause pain, but occasions great inconvenience, by allowing the bones to bend under the weight of the body and contraction of the muscles. It is accompanied with weakness and derangement of the whole system, the symptoms of which are a pale and sickly countenance, tumid abdomen, flabbiness of the muscles, and unhealthy evacuations. The earliest perceptible alteration of the bones is at the wrists, where the extremities of the radius and ulna become preternaturally large, and are apt to excite the suspicion of fracture. It is confined to the period of childhood, and seldom begins later than the second or third year of age. It affects chiefly the offspring of young or unhealthy parents, and occurs most frequently in cold moist climates. It terminates either in death or in a return to health, after months or years of duration. Contrary to what might be expected, rickety bones are readily broken by slight degrees of violence, and their reparation in such cases is effected chiefly by cartilage. When the bones regain their healthy nutritive action, they become as hard and unyielding as usual, retaining, however, the curvatures which have taken place during the softened state. The new osseous substance which is deposited during their subsequent growth occupies chiefly the concave side of the arches into which they are bent, where it has most effect in strengthening their power of resistance, and thus gives them a remarkable flattened shape.

Rickets used to be ascribed to the operation of a morbid acid humor pervading the system, and the remedy consequently consisted in liberally supplying the patient with alkaline and earthy preparations, in order to neutralize this acidity and replace the defective earth of the bones which was supposed to have been removed by its chemical agency. The disease is now referred, more consistently with scientific pathology, simply to disorder of the nutritive action of the osseous tissue, and the means employed to correct it are merely those which tend to strengthen the system in general, while every prudent precaution is taken to prevent the bones from suffering distortion so long as they remain exposed to it by their softness and flexibility.

With these objects in view, the patient ought to be frequently put into a warm bath, and every day have the whole surface of the body subjected to friction. He should be warmly clothed,

and, if possible, removed to a dry situation sheltered from the cold. His diet must be moderate, easily digestible, and nourishing; and he should abstain from all medicine, except what is required to maintain or excite the intestinal secretions. While the bones are in a yielding state, exercise in the erect posture may cause curvature and distortion, especially of the bones composing the trunk and inferior extremities; the patient ought, therefore, to be debarred from walking, running, etc., and encouraged to creep and roll upon the floor, or on the ground in the open air. Should the limbs unfortunately have been bent through neglect or injudicious treatment, they may often be straightened by the gentle and continued use of splints or other apparatus.

Mollities and Fragilitas Ossium.

By Mollities Ossium or Malacosteon is understood a general disease of the bones, in which they become extremely soft, much more so than in rickets, so that in its advanced stages there hardly remains any trace of the osseous texture, and the periosteum incloses merely a yellow or brownish mass of lardy consistence. This affection is attended with excessive and almost incessant pain—is almost confined to females—occurs chiefly at the middle period of life—and though often very slow in its progress, advances until the patient dies.

There is no effectual remedy for this malady, and its treatment consists in the use of means proper for palliating the patient's sufferings, of which the different preparations of opium are the best, and supporting the general health, for which purpose sea air seems to have most influence.

Fragility or unusual facility for being broken, naturally leads to the idea of a redundance in the earthy constituent of bones; and a certain degree of it depending on this cause is observed in old people; but the condition which is generally understood to be denoted by this title, and in which the proneness to breaking is so great that fracture is caused by the slightest external violence, or even by the action of the muscles in effecting the ordinary movements of the limbs, is a state of preternatural softness instead of increased density. Rickets, malacosteon, and the medullary-

sarcomatous degeneration all occasionally render the bones more liable to be broken; and fracture being sometimes the first obvious effect of the diseased action, is not only thought to be the cause that induced it, but also chosen as the characteristic feature for its designation. A remarkable degree of fragility has been observed in the advanced stage of carcinomatous disease.

Diseases of the Spine.

There are two morbid states of the spinal column which occur so frequently, and are attended with such important effects on the system, that they require to be considered by themselves. These are inflammation, and some of its consequences, with or without curvature, and curvature without inflammation.

When inflammation occurs in the vertebræ, it is seated in their bodies and intermediate cartilages, and is indicated first by a dull gnawing pain at the part, which is aggravated by pressure and motion; then a slight degree of swelling generally appears so as to make the spinous processes of the affected vertebræ appear more projecting than usual; the patient loses his appetite and strength, becoming dull and listless, and preferring the horizontal posture; his inferior extremities are reduced in bulk, and affected with numbness and rigidity; whence the gait is awkward and vacillating, the legs frequently crossing each other, while the trunk is held peculiarly erect and rigid, to protect the diseased part from motion. As the disease advances, the patient sometimes loses the use of his limbs entirely; and, in addition to his other complaints, is generally distressed by an uneasy feeling at the pit of his stomach, and a painful sense of constriction round the chest, in the region of the diaphragm. Suppuration usually ensues, and the matter is either confined to the neighborhood of the bone affected, or descends in the interstices of the soft parts so as to present itself lower down. When the dorsal vertebræ are affected, it generally points in the loins, and constitutes a lumbar abscess; when the lower dorsal or the lumbar vertebræ are concerned, it for the most part passes down along the psoas muscle, and appears in the groin, sometimes above, but more frequently below, Poupart's ligament, when it is named a psoas abscess. The matter, in order to point above Poupart's

ligament, must perforate the abdominal muscles and fasciæ, through means of absorption, which happens generally by a small aperture; the pus thus comes to be quite superficial, and diffused under the skin, from which circumstance the abscess may be erroneously regarded as entirely subcutaneous. It must be observed, that though chronic abscesses in the loins or groin most frequently proceed from diseased bone, they may exist independently of such sources, just as in other parts of the body.

When the pus ceases to be confined near the bone, and begins to drain away from it, the patient generally experiences great relief from his complaints. The pain becomes very much lessened, and the use of his limbs is often in some measure or altogether regained. But this amendment is usually accompanied by a serious change to the worse in another respect; since the vertebral column is apt to bend under its superincumbent weight, when weakened by the destruction of bone and intervertebral cartilage which attends the suppuration. The curvature in this case takes place forward, and being confined to a small extent of the spine, causes an acute projection behind, so that one or more of the spinous processes appear to be dislocated backward. This change of shape does not take place, either when the extent of the disease is small in proportion to the size of the bones in which it is seated, or when it is so great that the patient is constantly confined to the horizontal posture; but these circumstances are comparatively rare in proportion to those which favor the occurrence of curvature. If the morbid action ceases before suppuration, the bones affected unite with a degree of approximation proportioned to the amount of absorption which they have suffered; and if suppuration does take place, the surface of the abscess either heals with approximation and consolidation of its parietes—the vertebræ concerned appearing as if run into one mass—or a state of caries remains and gradually wears out the patient's strength.

This disease may occur at any period of life, but is by far most common in children from two to eight years of age. In adults it generally occupies a small part of the bone, and proves extremely obstinate, or rather always incurable, at least with such few exceptions as hardly deserve to be mentioned. In childhood it usually engages the whole substance of two or three adjoining bodies of the vertebræ, which on dissection are found almost

entirely wasted away, together with the intervertebral substance, portions of dead bone and pus occupying the cavity.

The disease is usually ascribed to twists or blows; but as these injuries are seldom thought of until long after they are alleged to have been received, and not before the symptoms attract attention, there is some reason to discredit their effect in exciting the morbid action. In children there is reason to believe that the first step of the morbid process is usually the deposition of scrofulous substance. It would seem that in adults the disease is liable to be excited by sexual excesses.

In conducting the treatment of this acute curvature, as it is generally named, surgeons proceeded formerly in the belief that the primary evil consisted in displacement of one or more of the vertebræ from violence; that the pain and loss of voluntary motion depended on pressure caused by the dislocated parts on the spinal marrow; and that the disease of the bones was not only caused, but kept up by, the irritation proceeding from their unnatural position. The practice, therefore, consisted in the use of mechanical contrivances for rectifying the displacement. The inefficacy and danger of such a mode of proceeding must be obvious to every one acquainted with the true condition of the bones, which having their substance destroyed more or less extensively, though separable by force, must resume their situation as soon as it is removed. And if the vertebræ are much weakened, or partially united, they will be very apt to suffer such fracture or disjunction as may render the limbs below permanently paralytic, or prove immediately fatal.

Mr. Pott, observing that curvature of the spine from rickets, though productive of the most extreme distortion and deformity, was not attended with palsy; and that the palsy accompanying the disease in question did not resemble the state which is induced by pressure on the spinal marrow, the muscles of the limbs being not soft and flaccid, but rigid and tense, concluded that the curvature was an effect, and not the cause, of the disease, which he thought might more reasonably be referred to inflammation seated in the bodies of the vertebræ, and causing more or less irritation of the neighboring spinal marrow.

With this view of the matter he used counter-irritation, by means of issues opened with caustic potash, as early as possible,

in order to subdue the inflammatory action, and interdicted the erect posture as increasing the irritation. Mechanical contrivances do not afford the diseased spine nearly the same repose which is obtained from the horizontal posture, and frequently occasion the greatest mischief, by pressing injuriously on different parts of the trunk, as well as by inducing the patient to indulge in exercises which the diseased spine cannot bear with impunity. There can be no doubt as to the soundness of the principle which constitutes the foundation of Mr. Pott's practice; but it certainly has been applied too indiscriminately. In the common case which commences with scrofulous deposition in the substance, or on the surface of the bones, and insidiously advances through its suppurative stage, no advantage can be derived from counter-irritation, which, on the contrary, may prove injurious by exhausting the patient's strength. In the case also, occasionally, though not so frequently met with, where the spine forms an acute projection posteriorly, becoming bent almost to a right angle, with little pain and no suppuration,—the bodies of the vertebræ seeming to be simply absorbed, so that the remaining rings and processes are consolidated together,—there is no use in opening issues. It is only when the pain and other symptoms that have been mentioned denote the existence of inflammatory action, that caustic or the actual cautery should be employed. The latter agent seems greatly preferable, and is to be applied longitudinally to the extent of a few inches on each side of the affected part, except when the neck is concerned, in which case the middle line may be selected for the purpose.

This disease occasionally affects the first or second upper cervical vertebra, with the corresponding part of the occipital bone. The symptoms, in the first instance, are the same as those which have been already described, consisting of deep-seated pain felt chiefly at night, and aggravated by motion. But, owing to the importance of the portion of the nervous system which lies within the direct influence of the disease when it is thus situated, namely, the lower part of the *medulla oblongata*, and the mobility of the joints concerned, the patient's sufferings are extremely severe. In eating and speaking he feels darting pains through the neck. In changing his position, he keeps the head perfectly steady, and employs both his hands to assist the muscles in preventing any

rotation or flexion of the affected vertebræ. He loses his appetite and strength; complains of almost unremitting and intolerable nausea; and exhibits, by a peculiarly anxious and unhappy expression of countenance, that he labors under a disease of the most agonizing kind. Loss of voice, difficulty of breathing, convulsions, and palsy occasionally supervene; the head generally suffers more or less distortion to one side, in consequence of the bone giving way under the ulcerative process; and at length, after months or years of misery, the patient dies, either gradually, from mere exhaustion, or suddenly, from dislocation of the odontoid process of the second vertebra, which becoming detached from the occipital bone, presses backward on the *medulla oblongata*. If an abscess forms, it is seldom evacuated previously to the patient's death, and sometimes opens into the pharynx.

The subjects of this disease are mostly children and young adults. The treatment requires rest of the head, together with counter-irritation, effected early and powerfully by the actual cautery; and practitioners ought to beware of mistaking the first indications of this destructive disease for slight rheumatic ailments deserving of no particular attention. The preparations in museums prove that the cure of the disease, though perhaps very rare, is not impossible.

The other disease of the spine which requires to be particularly considered, on account, not of its danger to life, but its frequency and important consequences in respect to the patient's appearance and comfort, consists merely in curvature, without any specific or general morbid affection of the osseous system. It is named the Lateral curvature; its direction being very rarely from behind forward, and almost invariably from side to side. It occurs chiefly between the ages of seven and seventeen; and, with few exceptions, is confined to the female sex. It generally comes on insidiously, increases progressively, and, terminating at a more or less advanced stage, leaves the patient permanently disfigured in a proportionate degree. The part of the spine principally affected is the dorsal portion, which, bending to one side, almost always to the right one, makes the corresponding scapula and shoulder seem larger and more prominent than usual. As the disease advances, a counterbalancing bend in the opposite direction takes place in the lumbar region, causing the hip concerned to appear enlarged.

When the spinous processes are traced downward from the neck to the sacrum, the alternate bending in their course may be readily observed. As the curvature continues to increase, the distortion becomes more and more apparent;—the trunk is shortened and compressed,—the ribs are approximated from side to side, and protruded forward to increase the capacity of the contracted thorax, which thus has its shape entirely altered, and is widest from before backward. However far the disease may proceed, the limbs and pelvis remain free from any participation in it.

In ascertaining the cause and nature of this curvature, the following circumstances which attend its commencement must be carefully recollected: 1. It occurs almost exclusively in females who devote a large proportion of their time, during the period when the morbid disposition exists, to the pursuits usually followed in undergoing a fashionable education, or to some sedentary occupation, which does not require or permit much bodily exertion. 2. It usually affects most seriously those individuals who possess a slender frame, or one characterized by indications of a phlegmatic temperament,—their bodies, though thick and bulky, being pale, flabby, and prone to all the morbid states depending on weakness of action. 3. Other things being equal, it occurs most certainly, and proceeds most rapidly, when the trunk is habitually maintained in a bent position.

The predisposition to the disease, therefore, appears to be constitutional weakness, and its exciting causes, circumstances which increase the weakness of the spine particularly, and promote its bending by the figure they make it assume. The strength of the spine depends partly upon the bones and partly upon the muscles composing it; and it is probable that the former are chiefly affected by the predisposition, while the latter are influenced more by the exciting causes. All muscles require frequent exercise for the preservation of their strength; but, during the occupations of drawing, playing, sewing, etc., while the extremities are either constantly employed, or, at all events, unrestrained in their movements, the trunk is not only held perfectly steady in one position, often a curved one, but is also compressed with the rigid articles of dress which are used under the erroneous expectation of improving the shape. The muscles of the back, therefore, becom-

ing extremely weak, and, indeed, as may be learned by actual examination, almost completely absorbed, are no longer able without an effort to restore the erect position of the spine when bent by the weight of the head and superior extremities, or by the occupation of the patient. It is consequently allowed to assume a permanent curve; and then the predisposition, which depends on a softened state of the bone, acts with full effect; because the more the column bends, the longer levers are afforded to the superincumbent pressure. As the distortion increases, the viscera of the thorax and abdomen are more and more compressed and displaced, their functions suffer corresponding derangement, and the whole system becoming disordered, the bones, even less properly nourished than before, lose still more of their resisting power. Should the patient unfortunately, during this process, fall into the hands of a machine-maker, who attempts to prop up the weak and twisted spine by means of iron frameworks, the morbid alterations which have been described will be accelerated; for all such contrivances must prove either insupportable to the patient, or inefficient in straightening the spine; and granting even that they could accomplish this, they would still labor under the great objection of confining the movements of the trunk, and preventing the muscles from obtaining that exercise which is essential to the recovery of their strength. The result would be not more satisfactory if the practitioner were to go to the opposite extreme, and, regarding the muscles as the sole seat of the disease, attempt to strengthen them by enjoining exercise in the erect posture, or, still worse, recommending a weight to be carried on the head, in order to render their actions in balancing it more energetic than usual. Such means, however useful in preventing curvature, must manifestly tend to increase it when once commenced.

In the management of persons predisposed by their age, sex, temperament, or constitutional make, to this disease, every means ought to be used for strengthening the system in general and the trunk in particular. All long-continued and constrained positions must be interdicted,—frequent exercise of such kind as calls into action the muscles of the trunk should be enjoined. The use of stays, corsets, and every rigid article of dress, however designated, must be strictly prohibited. If curvature has already

taken place, it is evident that the first step toward reparation must be relieving the weak and bent spine from pressure. The only mode of effectually accomplishing this is to make the patient assume the horizontal posture, which can be done without any great hardship, if a smooth well-stuffed sofa is provided, instead of the floor or a board, which is sometimes used for the purpose. When the curvature begins to diminish, the patient may rise occasionally for a few minutes, and exercise the muscles by some suitable employment, which ought never to be continued after the slightest feeling of fatigue is experienced. By persisting in this system, the disease will certainly be arrested in its course; the distortion, if not very great, will be removed; and the worst cases will be considerably improved.

CHAPTER XII.

JOINTS.

Sprains and Bruises.

THE ligamentous tissue is not productive of pain excited by the ordinary stimuli which occasion it in other parts; but though insensible to cutting and tearing, it suffers severely from being overstretched, in conformity with the general law, that the sensibility of parts bears some relation to their use in the animal economy. The articular cartilages and lining synovial membrane again suffer from violent compression. The symptoms and effects, primary as well as secondary, which proceed from these two sources, are very similar. Joints of the ginglymoid or hinge-like structure, and those of the arthrodia kind, such as the tarsal and carpal articulations, are exposed to the first-mentioned injury, while the ball-and-socket joints, though nearly exempt from it, are subject to bruises from their respective surfaces being squeezed together.

Both strains, or sprains as they are called, and bruises are attended in the first instance with severe sickening pain, and

more or less complete inability of using the joint. To these symptoms succeed swelling, tension, and, if the joint is superficial, discoloration from ecchymosis, and not unfrequently inflammation, particularly if the patient possesses a scrofulous or otherwise irritable constitution. The inflammation, when chronic, leads to thickening and adhesions of the articular apparatus, which occasion deformity and lameness, or morbid degenerations of the same part, which frequently end in the destruction of the joint; when acute, it tends to suppuration. The immediate effects of these injuries are always distressing, and their secondary consequences, though not certainly serious, are generally inconvenient, and often destructive of the limb. Such accidents, therefore, ought always to be treated with attention, so that nothing may be neglected in any way calculated to guard against bad consequences to the joint.

The means that afford most relief from the pain directly caused by the injury, consist in the application of hot fomentations and the preservation of perfect rest. The ecchymosis is often considered a warrant for leeching or cupping; but, as has been already explained, the blood which produces the discoloration, being effused from the vessels, cannot be withdrawn in either of these ways, and must be removed by absorption. If symptoms of inflammation come on, blood should be extracted freely, and the other means employed that will be mentioned when the inflammation of joints is considered. After the injured part has ceased to be painful on pressure or motion, and remains merely swelled and stiff, it ought to be supported by a bandage, and at the same time have some stimulating ointment or lotion applied to promote absorption. Blistering, warm pumping, the vapor-bath, friction, and gentle but frequently-repeated exercise, are useful at the same time, and with the same view.

Dislocation.

By Dislocation is understood displacement of the respective surfaces of an articulation. The dislocation may be partial or complete; and also simple or compound, in the same sense of these terms as when they are used with reference to fractures. It is simple dislocations only which will be considered under this sec-

tion, as those which are compound may be arranged more conveniently under wounds of the joints.

The joints least subject to strains are most readily dislocated, since the mobility and freedom of ligamentous connection which protect them from the former injury expose them to the latter. The circumstance of having been formerly dislocated increases the predisposition. The causes of dislocation are: 1, external violence; 2, inordinate muscular action; and 3, diseased alteration of the articular apparatus. The displacements which proceed from the last of these causes are named spontaneous dislocations, and will be considered along with the diseases which give rise to them.

The process of dislocation usually consists of two stages or acts: there being first the displacement of the articulating surfaces, which results directly from the violence that causes the accident; and then a further separation of them by the action of the muscles which formerly held the bones together, but now pull them past each other. These two steps are sometimes designated by the names of primary and secondary dislocation.

Of the symptoms of dislocation, the most constant and characteristic one, especially as a distinction from fracture, is immobility or fixture, when motion of the limb is attempted either by means of its own muscles or by an external force, which depends upon the unnatural position of the articulating extremities of the bones and the contraction of their surrounding muscles. The limb is generally shortened, but sometimes it is lengthened, and when the latter is the case there cannot of course be any suspicion of fracture. There are also attending the accident deformity from the altered situation of the bones, pain or numbness from their pressure on the muscles and nerves, and swelling with coldness from obstruction of the blood-vessels.

The treatment of dislocation consists in reducing or replacing the articular surface which has been moved from its proper position; in doing which it is necessary to counteract the forces that caused the two acts of removal. This is effected by first extending the limb, so as to draw back the bone to the point where the muscles began to operate in producing its displacement; and then urging it in a direction opposite to that in which the external violence primarily acted. These steps in the process of reduction, which are named extension and coaptation, have sometimes an

equal share in its accomplishment, but more frequently one or other of them is chiefly useful. In ball or socket-joints the first, and in hinge-joints the second, is chiefly used.

The dislocated bone ought generally to be extended in the direction which it has assumed in consequence of the displacement. The force for this purpose may be applied so as to act either directly on the bone itself, or on a part of the limb separated from it by one or more articulations. It has been objected to the former mode, that it causes compression of the muscles opposed to reduction; and to the latter, that, by keeping the limb straight, it is still more adverse to yielding of the muscles. It does not appear, however, that any practical inconvenience is experienced in either of these ways. The former method is on the whole more convenient in most cases, and is generally employed in this country. In order to make extension effectually, it is necessary to have counter-extension exerted on the corresponding surface from which the bone has been dislocated—viz., the one nearest the center of the body; and the more directly it is subjected to the power employed for this purpose, the more perfectly will the object in view be attained. The force employed for extension may be either simply the manual strength of one or more stout assistants, or this increased by the power of the pulley. In all cases of recent dislocation, except perhaps sometimes when the hip-joint is concerned, mere manual extension is sufficient, and it ought, therefore, in general, to be preferred, being more readily obtained, and also more easily managed, than the pulley. The best bandage for applying the extending force is a skein of worsted, or a folded shawl, which must be securely fastened to prevent it from slipping in the process. The best noose for this purpose is either the *clove-hitch*, as it is called by sailors, or another which is preferred by the French surgeons. It is executed by placing the band across the limb in a triple form, and then drawing each of its ends through the opposite loop.

The strength of the patient's muscles used to be weakened by bleeding—the warm bath—tobacco injections—and the tartrate of antimony, given in solution in small doses frequently repeated. The involuntary resistance was also lessened by making the patient speak, so as to prevent fixture of the thorax, which being the central point of attachment directly or indirectly to all the

muscles of the body, is instinctively rendered immovable whenever any strong effort is to be made. With a similar view it is sometimes advantageous to effect the extension suddenly, when it is not expected by the patient; but unless it should seem practicable to accomplish the reduction in this way instantaneously, the limb ought to be extended slowly and steadily, since the effect of the stretching force in subduing the contractile energy of the muscles depends more upon its duration than its degree. The introduction of chloroform has superseded the use of all other subsidiary means, and, by completely suspending muscular contraction, wonderfully facilitated the process of reduction.

Coaptation is more or less required according to the resistance which is opposed to the reduction by the shape and situation of the articular surfaces. As has been already remarked, it is generally least useful in the ball-and-socket joints, and of most advantage in those of the hinge form. In the former, it is sometimes not required at all; and in the latter, it is occasionally sufficient of itself to accomplish the operation.

After the dislocation is reduced, the joint ought to be protected against the operation of those circumstances which tend to renew the injury. It ought to be kept perfectly quiet, and frequently fomented, to allay the pain and irritation consequent on the laceration and bruising of the various injured parts. It might be expected that the immediate pain as well as the danger of consecutive inflammation would be greater in dislocation, where the ligaments are torn, than in strains, where they are only overstretched. But this is not the case, and though inflammation, both acute and chronic, may no doubt result from the former accident, it is seldom followed by any serious bad consequences of this kind.

When the dislocation is not reduced, the bone acquires adhesions to the neighboring parts round the margin of its articular surface, and by its pressure induces absorption of the surface it comes to act on, so that a cavity is formed for its reception, and a sort of new joint produced, which enables the patient to regain considerable use of the limb. While this process is going on, the old articular hollow gradually contracts, and ultimately becomes obliterated; so that, if the bone were displaced from its new situation, it could not be returned to its original one. The time that may elapse before reduction becomes impracticable, varies with

the age of the patient and the nature of the joint concerned, from two or three weeks to as many months. It is longer in old people than in young, and in dislocations of ball-and-socket joints than in those of hinge-joints.

SHOULDER-JOINT.—The head of the humerus may be dislocated downward, forward, and backward. The first of these displacements is the most common, and happens more frequently than the dislocation of any other joint. The accident is caused by external violence proceeding from falls on the hand or elbow, or blows on the shoulder while the arm is separated from the side, and also, though rarely, by sudden violent contractions of the *pectoralis major* and *latissimus dorsi* while the limb is in a state of abduction. In some rare cases it has been observed to occur during an epileptic convulsion. The capsular ligament is necessarily torn, and the head of the bone rests upon the neck of the scapula over the origin of the long head of the triceps.

The symptoms are elongation of the arm, which is stiff and powerless, projecting considerably from the side, and slightly bent, both the biceps and triceps being put upon the stretch. The tension of the former muscle generally occasions supination of the fore-arm; the axillary hollow is occupied by the head of the humerus; and under the acromion there is a remarkable depression instead of the usual convexity of the deltoid, from the absence of the bone. There is pain of the shoulder, numbness of the fingers, and more or less swelling of the whole limb.

The reduction may be effected by various methods, but the one which will generally be found most convenient, is to place the heel of the operator in the axilla of the patient, while both lie horizontally in opposite directions; then perform extension by pulling the hand of the affected arm; and finally effect coaptation by bending the limb inward over the fulcrum which is afforded by the foot. The great efficiency of this method depends upon the direction of the extending force, which is not opposed to the action of the *pectoralis major* and *latissimus dorsi*, as when the limb is drawn outward at a right angle to the chest. In every case which proves difficult, or is expected to be so, from the duration of the displacement, extension should be made downward, or in the longitudinal direction of the body, either by pulling with the heel in the axilla, or by employing the strength

of assistants, aided, if necessary, by the pulley, to draw the arm in this direction, while counter-extension is effected by a cushion secured in the axilla by a strap passing round the shoulders and secured to a wall or other firm support. In this way dislocations of several weeks' standing may be readily reduced; and even at the end of six or seven, success need not be despaired of; but beyond this period, notwithstanding occasional instances of success, the case in general must be regarded nearly hopeless.

In dislocation of the humerus forward, the head of the bone lies on the sternal side of the coracoid process, a position into which it can get only by suffering a secondary displacement after having been forced downward. The muscles then draw it upward and inward, as far as the clavicle allows.

In this case the limb is rather shortened. The elbow is bent and in the state of abduction, owing to the position of the head of the humerus, and, from the same cause, there is less numbness and swelling of the limb. There is not so much perceptible depression under the acromion, and the axilla is not so completely occupied as when it contains the head of the bone. As might be expected from the negative character of these symptoms, the diagnosis is not so easy as that of dislocation downward; and hence practitioners who are not sufficiently careful frequently overlook the nature of the accident.

The reduction should be performed as in the former case; but it is here still more advantageous to extend downward, in order to dislodge the bone from the position into which it is drawn by the muscles.

Dislocation of the humerus backward or outward is very rare. In the few cases of it which have been observed, the head of the bone lay between the scapula and infra-spinatus muscles, below the spine, so as to cause a distinct external swelling in this situation, and a deficiency at the fore part of the shoulder. The arm was directed forward across the chest, and could not be moved into any other position without both force and pain. The reduction is easily effected, the extension being made in the direction which the limb retains from the accident.

In all very recent cases of dislocation of the shoulder, and more especially within an hour or two after the accident, there is a considerable chance of effecting reduction by suddenly rotating

the arm outward, and at the same time drawing the elbow backward, while the operator's hand in the axilla urges the head of the bone into its place. In such circumstances, therefore, this simple method ought always to be tried in the first instance,—of course without any intimation to the patient of the intention to do so, which would certainly excite opposing action of his muscles.

ELBOW-JOINT.—The elbow-joint is liable to various sorts of dislocation, the diagnosis of which is often very difficult, especially as fractures near or through the articular surfaces produce in some respects similar symptoms. There is a difference of opinion as to the comparative frequency of these accidents, and also as to the characters for distinguishing them, with the exception of one dislocation, which is certainly the most common and best marked of the whole. This is displacement of both bones of the fore-arm backward. The articulating extremity of the humerus stretches the biceps and *brachiæus internus*, occasions a hard tumor at the bend of the arm, and generally causes permanent semiflexion of the limb, though sometimes, as I have had occasion to see in several instances, the arm is straight. The olecranon projects behind further than usual, and the triceps is much relaxed. The fore-arm appears shortened. This accident happens from falls on the hand while the arm is bent.

The reduction is very easily performed by making extension, and then bending the fore-arm, while the surgeon, embracing the elbow with his hands, so that the fingers rest on the olecranon and the thumbs on the extremity of the humerus, pushes the displaced bones into their proper position.

The radius is liable to be dislocated separately, and may be driven either forward or backward. In the latter case, the displacement is so obvious from the tumor which is caused by the head of the bone, that it can hardly be overlooked; but in the former, which is the more common of the two, the nature of the accident is very apt to escape detection until it is too late to afford relief.

The symptoms are pain and swelling about the elbow, which is half bent, and allows a slight degree of flexion and extension; any attempt to increase the former being attended with a sudden snap or catch, owing to the head of the radius, which lies over the coronoid process of the ulna, striking against the humerus. I

have seen in one case the flexion continue quite free. The form of the fore-arm is altered, being round, instead of flat from side to side. When the hand is rotated, the radius is felt rolling under the origin of the flexor muscles, and a cavity is perceived where its head ought to be. Both forms of this accident result either from direct violence sustained on the elbow, or from falls on the hand. The reduction is very easy if performed early, and requires merely that the hand should be extended while pressure is made on the head of the bone and the elbow is bent. The extending force is made to act on the hand, in order to concentrate it as much as possible on the radius; since, if acting on the ulna, which has not been displaced, it could not do any good. Lateral dislocations of the elbow are occasionally met with, and when examined early may in general be easily recognized by the alteration of shape and direction of mobility which attend them. The reduction is effected chiefly by coaptation, and is not difficult, unless the parts concerned have been allowed to become rigid and adherent.

Wrist-joint.—The wrist often appears to be dislocated, owing to the swelling and immobility which it suffers in consequence of external injury, but these symptoms in the great majority of cases are merely the effects of sprains; and real dislocation of the joint is an extremely rare occurrence. It may take place in two directions, forward and backward, the bones of the carpus being driven upward under either the extensors or the flexors. The causes are falls on the hand. The reduction is effected by extending the hand and pressing on the dislocated bones.

Thumb.—The first or proximal phalanx of the thumb is occasionally dislocated from its connection with the metacarpal bone in consequence of falls or blows. It is driven upward and backward, where the extremity can be felt distinctly, while that of the metacarpal bone is not less perceptible on the palmar side.

The reduction of this apparently trivial displacement has been generally found very difficult, and sometimes altogether impracticable, the reason of which would seem to be, that the lateral ligaments of the joint remain more or less entire, and being stretched by the wedge-shaped extremity of the metacarpal bone in passing between them, afford a serious obstacle to its return.

The best mode of proceeding is to extend the thumb with moderate force, and at the same time to exert strong pressure on the extremity of the phalanx in the proper direction for pushing it into its place. The operation, when thus performed, is sometimes executed with great facility. In cases where the difficulty proves insuperable, one of the lateral ligaments may be cut, which would certainly be better than leaving the bone unreduced, as has sometimes been the case. A needle sharp on the edges, or a very small knife, should be employed for this purpose, so as merely to puncture the skin.

FINGERS.—Both the proximal and distal, or first and third phalanges of the fingers, are occasionally dislocated backward, so that the displaced extremity rests on the dorsal surface of the corresponding bone. The accident can hardly be overlooked or mistaken, and the reduction is generally very easy, provided the force employed be directed chiefly upon the projecting end of the phalanx.

HIP-JOINT.—The hip-joint, notwithstanding the great strength of all the parts which enter into its formation, is subject to dislocation in four different directions: 1. Upward and backward on the dorsum of the ilium. 2. Backward into the sacro-ischiatic notch. 3. Downward into the *foramen ovale*. And 4. Forward upon the pubis.

In dislocation upon the dorsum of the ilium the limb is shortened from one and a half to two inches—the affected knee is bent over the sound one—and the foot is turned inward so that the great toe of it rests on the tarsus of the other. The thigh cannot be moved except slightly inward—the *trochanter major* is higher up and nearer the crest of the ilium than usual—and the head of the bone can sometimes be felt rolling under the muscles when the limb is moved.

This accident happens from falls on the side, and the circumstance of having a load on the back promotes the dislocation by increasing the strain. It happens most frequently in males, and is seldom met with either in very young or in very old subjects, being in a great measure confined to those in the vigor of life.

To effect reduction, the patient should be placed on a mattress upon his back. A folded sheet or table-cloth is then to be passed between the thighs, so as to support the perineum, its ends being

either held in the hands of assistants standing behind the patient's head as he lies supine, or secured to a ring in the wall. A skein of worsted, or any other suitable lac, is next fastened round the limb immediately above the knee, and committed to assistants, either trusting to their own strength for extending sufficiently, or aided by pulleys if the case promise to prove difficult. The points of extension and counter-extension having been thus determined, any degree of obliquity that seems requisite may be easily given to the former by turning round the mattress a little, until it appears that the limb is extended exactly in the line which it has assumed from the dislocation. It is usual to rotate the leg, and at the same time use means for drawing the neck of the thigh-bone outward so as to lift its head over the edge of the acetabulum; but from my own opportunities of observation I am led to believe that any such interference is quite unnecessary, since the extension, if sufficiently powerful and properly directed, completely attains the object, as the muscles generally pull the head of the bone into its place when it has been carried far enough; but if it should seem that the margin of the acetabulum opposes any resistance to its return, the difficulty may be surmounted by drawing the upper part of the thigh outward while the knee is still held across the sound one.

The dislocation into the ischiatic notch is produced much in the same way as that on the dorsal surface of the ilium, but does not happen so frequently. The symptoms also are similar, and differ only in being less marked. There is less shortening—less bending of the affected limb over the sound one—less inversion of the toes—and less displacement of the *trochanter major*. In obscure cases, a good diagnostic will be afforded by trying to bring the thigh into a straight line with the trunk of the body, which is impossible while the bone is thus displaced. The patient, when lying upon his back, finds it necessary either to arch the loins so that the surgeon may press his hand between them and the bed, or to keep the thigh bent upward on the pelvis. If the back is straightened the thigh ascends, and if the thigh is laid flat the back becomes arched. The reduction is accomplished in the same way that has just been described, though it has been found to require more force to lift the head of the bone out of its preternatural situation.

The dislocation downward is caused by heavy bodies falling on the hip while the limb is in a state of abduction. The symptoms are extremely characteristic, there being elongation to the extent of an inch and a half—abduction, owing to the stretching which is suffered by the gluteal muscles—and flexion of the thigh on the pelvis, from the same cause affecting the *iliacus internus* and *psoas magnus*. These symptoms are often simulated to a very perplexing extent by the involuntary obliquity of position which the pelvis acquires from irritation of the hip-joint, occasioned by blows or other kinds of external violence; and inexperienced practitioners are consequently apt to commit the mistake of treating with rough measures a case that requires those of the most soothing sort. The best guide in avoiding this too common error is afforded by the *trochanter major*, which, when dislocation really exists, will be found by measurement to be more distant from the anterior spinous process of the ilium than its fellow is on the other side. The reduction is accomplished by extending and counter-extending the thigh and pelvis transversely, while the foot of the affected limb is carried inward under the sound one.

The dislocation forward on the pubis is caused by the body being suddenly bent backward, while the foot is fixed and the limb is kept straight by the strong involuntary action of its extensor muscles. The symptoms are slight shortening, eversion of the toes, and the head of the bone being felt distinctly rolling under the integuments of the groin. The reduction is performed by extending downward and backward, while the patient lies on his sound side, and then drawing the upper part of the thigh outward, so as to lift the head of the femur over the acetabulum.

It has often been a question at how great a length of time after the dislocation reduction may be effected. I have succeeded at the end of seven and nine weeks; but, in using force at a more distant period, should have little hope of success, and some fear of doing harm, by deranging the process by which the displaced bone becomes accommodated to its new position.

KNEE-JOINT.—The patella may be dislocated laterally by direct violence, and this accident is most apt to happen when the parts concerned are in the relaxed state, which results from sudden

removal of a dropsical effusion into the joint. The dislocation is very readily recognized, and admits of easy remedy, by bending the thigh upon the pelvis while the knee is straight, so as to relax the extensor muscles completely, and then pressing the patella into its proper place.

The tibia and fibula are so strongly connected with the femur that they very seldom suffer dislocation. In consequence of a violent wrench to one side, there is sometimes a laceration of one or other of the lateral ligaments, and a partial displacement of the articulating surfaces of the tibia. In the rare cases of its complete dislocation, it has generally been found behind the femur; but according to Sir A. Cooper, it may also be driven forward. The accident is very readily recognized, owing to the great size of the articulating surfaces and the thinness of their surrounding parts. The reduction, which is not difficult, requires extension and counter-extension, accompanied with pressure on the dislocated bone.

It is thought that the semilunar cartilages are subject to displacement, since persons of relaxed frame sometimes complain of pain and stiffness in moving the knee, which are felt suddenly, and disappear no less so, when the joint is forcibly bent and extended.

ANKLE-JOINT.—Though the ankle is frequently dislocated as a consequence of fracture through either malleolus, as has been noticed under the proper head, yet dislocation happens so rarely by itself that it is hardly necessary to mention the possibility of its occurrence. This dislocation can be only backward or forward, and is reduced chiefly by coaptation.

ASTRAGALUS.—When a person falls from a height on his heel, the violence thus sustained not being diffused over a number of articulations, as when he alights on his toes, is transmitted to the astragalus with such intensity as sometimes to eject it from its place, turn it upside down, and make it protrude under the integuments of the instep, or force its way through them. This dislocation seldom admits of reduction, and the bone, when so displaced, must in general be removed. If an opening has not been caused by the accident in the first instance, one ought to be made without delay, in order to anticipate and prevent the violent inflammation that will otherwise occur, as the precursor of ulcera-

tion or sloughing, by which the loose astragalus must make its escape.

Lower Jaw.—The lower jaw cannot be dislocated so long as the mouth is closed, since the condyles are then firmly secured in the glenoid cavities. But when it is opened so as to bring them forward on the anterior convex part of the articular surfaces, they may be readily displaced by a lateral impulse, or even by excessive action of the muscles. One or both of the condyles then glide forward over the root of the zygomatic process; and sinking into the hollow on the opposite side, retain the jaw fixed in a state of expansion.

The reduction of this dislocation is extremely easy, since, if a fulcrum be placed at the back part of the grinding surface, the anterior portion of the jaw affords a powerful lever for replacing the deranged condyle or condyles. The best fulcrum for this purpose consists of one or both thumbs, accordingly as the dislocation is single or double, protected from the action of the teeth by being wrapped in the corners of a handkerchief or towel. After the reduction, the patient ought for some time to avoid opening his mouth wide, and exposing his jaw to the circumstances which favor a recurrence of the accident, as a considerable predisposition to it remains.

Clavicle.—The sternal extremity of the clavicle is sometimes dislocated forward, in consequence of falls on the shoulder or arm. The displacement is readily recognized by the swelling arising from the projecting end of the bone and superjacent portion of the sterno-mastoid muscle, together with the mobility of the clavicle and depression of the shoulder that proceed from it. The dislocation is readily reduced by elevating the shoulder and pressing down the sternal extremity of the clavicle, but returns so soon as the restraint which produces these effects is removed. A bandage, therefore, sufficient to retain the bone permanently in its proper position, should be applied; and the apparatus best calculated for doing this, consists of a sling to support the arm, together with a compress placed on the end of the clavicle and secured by means of a figure of 8 bandage.

The acromial extremity of the clavicle is also occasionally dislocated; but this accident requires no particular consideration, as its causes, symptoms, and treatment are the same as

those of fracture of the acromion, or acromial extremity of the clavicle.

VERTEBRÆ.—The vertebræ are very seldom dislocated without fracture or morbid alteration of the bones; and in all cases the accident is of importance chiefly in respect of the organs contained within the vertebral column, along with which, therefore, it may be more properly considered.

Wounds of the Joints, and Compound Dislocations.

The synovial membrane is very prone to acute inflammation, which causes violent constitutional disturbance and leads to the most destructive morbid alterations. Wounds of the joints, therefore, must always be regarded as serious injuries; and the more so in proportion to the size of the joint and degree of irritation which accompanies the wound.

The great object in treating such wounds should be to make them heal, if possible, by the first intention, which, of course, prevents the necessity of inflammation as the precursor of granulating action. With this view, all sources of irritation, whether direct or indirect, that may seem to exist, ought to be removed. If there is displacement of the articulating surfaces, they ought to be accurately reduced; and if the head of a bone protrudes, it should be cut away with the saw or pliers, since the distention that would be caused by its pressure would be apt to excite inflammation. The edges of the wound should be placed in contact, and assiduously cooled by wet cloths frequently changed, while motion of the limb is carefully prevented by the application of splints. The constitutional treatment is to be conducted with the same view. The diet, in general, should be strictly antiphlogistic; but here exceptions may require to be made on account of the peculiar circumstances of the case.

When compound dislocations are treated on these principles, the necessity for amputation, which used formerly to be generally performed as their only remedy, is greatly lessened. The ankle-joint is most subject to the accident, and the formidable appearances which are presented by it seem at first sight to warrant the removal of the limb; but when the projecting extremities of the bones are sawn off, the distortion rectified by suitable splints or

bandages, and the edges of the wound placed fairly together, the cure is often accomplished very readily. The elbow and wrist-joints also may in general be preserved, but the knee joint, when subjected to the great irritation which attends both a dislocation and penetrating wound, can hardly be expected not to inflame, and either prove speedily fatal or require subsequent amputation. Hence in such an injury the limb will generally require to be amputated immediately. Gunshot wounds of the shoulder and elbow, unless the integuments, blood-vessels, or nerves are much injured, may be remedied by cutting out the articulation, as in cases of caries.

Inflammation of Joints.

Inflammation of the joints is attended with deep-seated pain, greatly aggravated by motion or pressure, swelling, redness, and tenderness of the integuments, and more or less constitutional disturbance, according to the intensity of the local symptoms. It is caused by the direct irritation of wounds, strains, and bruises; and indirectly, by exposure to cold, errors of diet or exercise, and whatever induces derangement of the system. The consequences of inflammation in this situation are numerous and important, as might be expected from the number and nature of the textures which enter into the constitution of the articular apparatus. The synovial membrane becomes the seat of dropsical and purulent effusions, adhesions, thickening, and gelatinous degeneration; the cartilage suffers ulceration and exfoliation; and the bones are liable to suppuration, caries, and anchylosis, or union of their respective surfaces. The consequences of inflammation are serious in proportion to its severity and the unsoundness of the patient's constitution; but it ought always to be dreaded, and induced, if possible, to terminate in resolution.

When the symptoms are acute, blood should be freely abstracted locally by leeches or cupping; and if there is much strength of action in the system, general bleeding may also be practiced. Calomel and opium are very useful where there is much irritability; and the tartrate of antimony, given in frequently-repeated doses, is a most valuable remedy, not only by allaying violent action, but also by promoting the secretions of the skin and

mucous membranes. When the inflammation is subacute, warm fomentations, anodyne liniments, such as the liniment of soap and opium, with the internal use of diaphoretic medicines, as Dover's powder, calomel and opium, or *vinum colchici*, afford most relief. In its chronic state, counter-irritation effected by stimulating liniments, blisters, tartrate of antimony, setons, and issues, especially those made by the actual cautery, with perfect rest, and a moderate degree of pressure, are the means which deserve most confidence. In preventing motion, and effecting the compression deemed requisite, the best means certainly consist in the application of leather splints. Pieces of bend-leather, cut to the proper size, having been moistened and placed on each side of the joint, are closely moulded to its form by the pressure of a common roller. When dry and rigid, they are taken off and lined with some thinner and softer leather; after which they are again bandaged on, and employed so long as may be necessary. In cases where the knee is severely affected it is very important to prevent motion of the ankle-joint also, and for this purpose I find nothing so useful as a splint of iron wire covered with chamois leather, extending from the middle of the thigh to the toes.

Dropsy of the Joints.

The synovial membranes of the joints, though all similar to each other, and resembling in structure as well as function the serous coverings of the soft parts, are not equally subject to dropsical effusion. It is extremely common in that of the knee, but very rare in all the others.

Dropsy of the knee-joint is occasioned by a great variety of circumstances. It occurs most frequently in persons of weak and irritable constitutions; who often suffer from it in consequence of very slight direct irritation, such as twists and bruises, or the indirect operation of exposure to cold. It is met with, however, occasionally in the strongest frames; but then the irritation is always direct and severe; such as fracture of the patella or femur, especially in its lower third, or a violent strain. The effusion generally appears almost immediately after the injury is received, and is at first attended with more or less acute symptoms of inflammation. It is readily recognized by the swelling and fluctua-

tion which are caused by its presence. The enlargement reaches as far up the thigh as the synovial membrane extends, it fluctuates when subjected to pressure, and the patella is felt to float, as it were, so that it may be made to strike upon the condyles of the femur if pushed downward with moderate force.

The means employed for treating this affection must vary with the acuteness of the inflammatory symptoms which attend it. In the first instance, it is often necessary to cup or leech and foment the joint, while constitutional remedies of a co-operative kind are at the same time administered. When the swelling ceases to be painful, but continues still more or less red, tender to pressure, and unable to bear motion, a cooling discutient lotion may be used with advantage. Finally, when there is no longer any indication of excited action, and the only inconvenience that remains is merely that occasioned by the presence of the fluid, the joint should be blistered once or oftener, according to the extent and duration of the disease, and then carefully bandaged. In cases of a rheumatic kind, blisters may be employed at an earlier stage with advantage. For some time after the cure is completed, the patient should wear a laced or elastic knee-cap, to protect the joint from the various external injuries to which it would be exposed in consequence of its weakened state.

Movable Cartilages in Joints.

Small movable bodies are occasionally met with in the cavities of the joints, either quite detached or connected with the parietes of the articulation by a narrow neck. They have a glistening pearly luster, and when divided are found to consist of a gristly substance inclosed in a firm capsule, with a bony nucleus in the center. They are of various magnitudes, from the size of a barley-corn to that of a pigeon's egg, and are also very different in their shape, which is generally round, oval, or lenticular, but sometimes tuberous. They exist either singly or in numbers together, but seldom exceed two or three. They have been discovered in several of the joints, but are by far most common in the knee. Even here, however, their presence may be considered a rare occurrence. They generally make their first appearance in adults.

The origin of such bodies has been ascribed to the effusion and organization of blood and lymph—to the detachment by fracture of a portion of the articular surface—and to the separation of morbid growths from the margin of the cartilages of the joints. The last of these explanations is on the whole the most probable, as the bodies in question are often observed by the patient to be fixed before they become movable, and they have been repeatedly found on dissection adhering to the extremities of the bones. It may also be observed that, so far as can be learned by external examination, they do not suffer any change of shape or size after they are first discovered.

These bodies occasion no inconvenience, except when they happen to be squeezed between the opposite articular surfaces; they then excite a sudden and severe sickening pain, which forces the patient instantly to desist from the exertion in which he was engaged, and may even make him fall at once to the ground. In consequence of this irritation, repeated from time to time, the joint becomes the seat of a dropsical effusion, which is sometimes the first symptom of the disease that attracts the patient's attention, as he is apt to account for the pain previously suffered by referring it to rheumatism. Unless proper means are now employed, the use of the limb may be almost completely lost.

The radical cure is easily effected by cutting into the joint and extracting the cause of irritation. But this very simple operation is attended with considerable risk of exciting such a degree of inflammation as to endanger not only the patient's limb, but also his life. In order to diminish the danger, as far as possible, the patient should be confined to bed, and restricted to a regulated diet for some days previous to the operation. The cartilage should then be moved into that part of the joint which is most superficial—as over the flat surface of the external condyle in the case of the knee—and held steadily there, while a free decided incision is made down upon it, so as to allow of its escape when urged out by the same pressure that was employed previously to fix it, and render unnecessary any groping with hooks, forceps, etc., which must increase the chance of inflammation. The edges of the wound ought to be placed together, and kept constantly cool with wet cloths; the joint being at the same time protected carefully from motion and all other kinds of irritation. It oc-

curred to me, and nearly at the same time to a French surgeon, M. Goyrand, that the object of this operation might be attained more safely by merely dislodging the movable body from the joint by puncturing the skin with a needle or narrow-bladed knife, and opening the synovial membrane by a subcutaneous incision, through which the body could be pushed into the cellular substance. The first case in which I tried this method was attended with a satisfactory result. The patient, a man about 40, of a very irritable constitution, was admitted into the Infirmary on account of a cartilage in the knee, which completely disabled him for any sort of active employment. Superficial suppuration took place a few days after the dislodgment; and it being necessary to make an opening for the discharge of matter, I took the opportunity of extracting the cartilage. The joint remained free from disturbance. In executing this procedure the knife should be used very freely, so as to let the body escape without a dangerous degree of manipulation. Another method, which generally succeeds, is making a free subcutaneous incision through the synovial membrane and cartilage, and applying a blister over the part, where it is retained by a compress and bandage.

Gelatinous Degeneration of the Synovial Membrane.

The synovial membrane is liable to a process of morbid nutrition which changes its natural structure into a soft grayish-yellow gelatinous mass, varying in thickness from a line to half an inch or more. This alteration usually occurs in individuals who are disposed to scrofulous action, whence it is generally named the Scrofulous affection of the synovial membrane. Though met with at all periods of life, it most frequently commences in young persons before the age of puberty, and is generally induced by some local cause of irritation, though there are many cases in which its origin seems to be entirely spontaneous.

The first symptoms of the disease that attract attention are swelling and diminished mobility of the joint affected. The swelling is soft, elastic, and colorless, and is diffused over the whole extent of the synovial membrane which does not cover the articulating cartilages. As the morbid thickening increases the degree of enlargement and stiffness keeps pace with it, but still

the patient hardly complains of pain. If the parts be examined by dissection during this stage, the synovial membrane is found more or less thickened, gelatinous, and vascular; the surrounding cellular substance is greatly thickened and condensed by albuminous effusion into its interstices, and the ligaments do not present an outline so distinct as usual, being matted together with the adjacent tissues. The joint may remain thus altered for months, or even years, without suffering any further change; but the diseased condition at last terminates either in absorption or suppuration. In the former case, the articulation is restored more or less completely to its previous condition, but almost always continues somewhat swelled and stiff; in the latter, openings into the joint are formed for the discharge of matter, the articular cartilages exfoliate or are absorbed, the cancellated structure of the bones is exposed, and the patient, if not relieved, either dies hectic, or recovers with a limb rigid and shriveled. Instead of the joint, there is then either a perfectly unyielding union by osseous matter, which is named Anchylosis, or a firm fibrous bond of connection, constituting what is called false Anchylosis.

The treatment of the disease in its first stage ought to be directed with the view of preventing inflammation, inducing it to terminate in resolution, if actually existing, and promoting absorption of the morbid structure. In attaining the first of these objects, it is necessary to protect the joint concerned from all irritations, both direct and indirect. Not only strains, blows, and violent exercise should be avoided, but also motion of any kind or degree; to prevent which the more effectually, splints of leather may be advantageously employed, the limb being fixed in that position which will render it most useful to the patient after the cure is completed. The various actions of the system should be supported by a moderate allowance of nourishing food—by exercise of such kind as will not derange the affected limb—and by medicine when it is found necessary. Should inflammation be unfortunately excited, leeches, cupping, fomentations, and general remedies, if the severity of the symptoms seem to require them, must be promptly and freely resorted to. But, in promoting absorption, it should be recollected that, as the disease depends upon a disordered state of the system, local remedies can be of very little

service. Cod-liver oil, protection from cold, and freedom from motion, have the most powerful influence, while pressure, ointments of iodine with mercury, and lotions, are of hardly any use. Mr. Scott brought the advantages of pressure very prominently forward, and led many people to believe that in this, as well as some other chronic affection of the joints, it may be deemed an almost certain remedy. Sir B. Brodie seems to have gone into an opposite extreme in regarding the disease as incurable, and all the remedial measures proposed for its removal as at best only palliative. Pressure is apt to occasion pain, and by thus exciting irritation, give rise to inflammation, so as to hasten on the malady to its last stage; it ought, therefore, to be employed with great caution. The best plan of treatment is, after subduing any inflammatory symptoms that happen to exist, to surround the joint with a common roller, applied so firmly as to effect the desired degree of compression. Mr. Scott recommended slips of plaster instead of the roller, and changed them not oftener than once in several weeks. But this practice seems objectionable on several grounds, since inflammation may thus be very easily overlooked, and allowed to proceed the length of suppuration before it is discovered; and if things go on well, it is obvious that in a very short time the diminution of the swelling must render the bandage loose and inefficient. The joint should always be restrained from motion by a splint, which may be made of leather or pasteboard, or iron wire covered with chamois leather. The last-mentioned splint, which I have found extremely useful in treating affections of the joints, may be easily constructed by bending a piece of strong wire to the shape of the limb, so as to extend along both sides of it—and then joining as many pieces transversely as seem necessary to give sufficient strength—after which the apparatus merely requires a leather covering, between the layers of which some cotton or other soft substance may be placed.

When suppuration ensues, free vent ought to be afforded to the matter. Stimulating washes should be applied to the sinuses, and moderate pressure still carefully continued, together with, if possible, even more rigid abstinence from motion. If the patient's strength proves inadequate to support the profuse and long-continued discharge which is apt to result, he must be relieved

by amputation, or excision of the diseased bone. It might be thought that the diseased synovial membrane would oppose the completion of a cure, even after the carious bone was eradicated, but experience has proved this to be not the fact; and all trace of the morbid structure in question soon disappears during the suppuration which succeeds the operation.

Ulceration of the Cartilages of the Joints.

The cartilages which cover the surfaces of articulation are often found to be destroyed more or less completely, becoming in some cases merely thinner than usual—in some rough and irregularly abraded—and in others detached from the bone, so as to lie in their natural situation, but nearly or altogether loose. These changes are ascribed to a process of absorption in the cartilages, commencing either on the surface of the synovial membrane which lines them, or in the substance of the cartilage. Ulceration of the cartilages occurs at all ages; but is more common in adults than the disease which originates in thickening of the synovial membrane. It is met with both in persons of scrofulous constitutions and in those subject to rheumatism, but chiefly in the latter. The exciting causes are irritations of various kinds, both direct and indirect, such as strains, bruises, and exposure to cold. It is indicated by deep-seated gnawing pain, often referred to one particular point of the articulation, aggravated by motion, and felt most severely at night. The patient also generally complains of pain in the joint beyond the one affected, or in more distant parts of the limb, which is usually throughout its whole extent more or less weak, œdematous, and cold. There is little swelling in the first instance, and no great degree of it subsequently, unless thickening of the synovial membrane be associated with abrasion of the cartilages, which is not unfrequently the case. When there is no swelling from this source, the enlargement that does take place is confined to the immediate neighborhood of the joint, and is of a more firm, unyielding consistence than that accompanying the other disease, as it depends merely on thickening and condensation of the cellular substance.

Ulceration of the cartilages sometimes causes such violent pain and hectic irritation of the system as to require amputation even

while the parts remain in the state that has been described; but, in general, it either goes on to suppuration, or terminates in recovery. When suppuration takes place, the joint passes into nearly the same condition as that which exists in the last stage of the disease originating in the gelatinous degeneration of the synovial structure, so that it would be difficult to discover from dissection where the morbid changes had commenced; and the case admits of cure only by anchylosis. When the disease terminates favorably before suppuration, some stiffness of the joint almost always remains. It appears that the articulating cartilage is never restored, whether it has been removed by interstitial absorption or destroyed by ulceration, and that the osseous surfaces deprived of it either unite together by means of a fibrous or bony medium, or become extremely hard and perfectly smooth, so that they seem as if incrusted with porcelain. This Porcelaneous alteration of the articular surfaces, as it has been called, is far from rare in its occurrence. The corresponding bones are often grooved and ridged, so as to allow of motion in only one direction, and there is always an effusion of new osseous substance around the margin of the joint, as if an attempt had been made to effect anchylosis. This condition may be regarded as a substitute for the cartilage in facilitating motion, and is observed occasionally in the new joints resulting from dislocation. If the stiffness depends on true anchylosis or osseous union, it does not admit of any remedy, but when the connection is of a fibrous kind, much may be done to increase the degree of mobility.

In conducting the treatment of this disease, the first object is obviously to protect the joint from all irritations tending to render the morbid action more acute and hasten it on to suppuration. For this purpose perfect rest, insured by means of splints and bandages, together with strict attention to the various secretions, ought to be particularly insisted upon. The next and not less important object is to subdue the chronic inflammation or ulcerative action, which is going forward. With this view all sorts of counter-irritation are in common use, but it appears that the choice of them need not be very extensive, if due regard be paid to their effects. Issues have unquestionably most power in checking the morbid action, but the means by which they are opened is not a matter of indifference. Caustic, moxa, and the

actual cautery may all be employed for the purpose, but the last-mentioned agent is infinitely preferable to the others. It is often thought that the pain which attends the opening of the issue affords all the benefit that is derived from it, and that, therefore, the moxa, which usually produces a superficial effect, should be selected. But it is well ascertained that any considerable amendment can in general be hardly perceived until the discharge of the new secreting surface has been fairly established. The ulcers of burns are always very slow in healing, and hence there is an obvious advantage of the cautery over the caustic; but its chief recommendation is the result of experience, and this is so strong as to leave no room for doubt or hesitation in preferring it to the other means. When the cautery is used, an eschar three or four inches long should be formed on each side of the joint. In mild cases, and during convalescence, the forcible aspersion of warm water by pumping, or pouring from a height, is attended with much benefit. To remedy the rigidity that remains after recovery, steaming with the vapor of hot water, frictions with gently stimulating liniments, shampooing, and persevering exercise are the means that ought to be employed.

Nervous or Hysterical Affections of the Joints.

Young women, particularly those of the higher ranks, are apt to suffer from painful sensations in the joints, which closely simulate the symptoms of articular disease connected with alteration of structure, and consequently are apt to lead to treatment no less unnecessary than injurious. Counter-irritation and confinement in such cases tend to increase the constitutional derangement which gives rise to the complaint, and ought, therefore, to be carefully abstained from, unless it may be thought necessary to make an impression, in the first instance, on the patient's mind by some active measures. In general, the proper course is to pursue an invigorating mode of life by using the shower-bath, taking the preparations of iron, and regularly exercising the limbs as well as the body. The spine, knee, hip, ankle, and wrist joints are the most common seats of this troublesome affection.

In respect to its diagnosis, the absence of swelling, or any other symptom except pain, together with the time of life and

general condition of the patient, constitute the best marks of distinction from structural derangements. Sir B. Brodie, to whom the profession are much indebted for the attention which he has directed to this form of nervous disease, considers, as one of the best characters for its recognition, the sensibility of the patient to impressions on the surface of the joint that cannot possibly affect the condition of the articulation, pinching the skin being equally effectual for causing wincing, as moving the limb or pressing the articular surfaces against each other. The whole system is usually observed to be in a highly sensitive excitable state; but sometimes presents all the characters of perfect health. The uneasy feelings, though frequently remaining months or years, generally commence and disappear suddenly —whence empiricism is afforded a good field, which has been diligently cultivated.

Morbus Coxarius.

The morbus coxarius, or hip-disease, is an affection of the hip-joint, which requires separate consideration, not so much on account of any peculiarity in its nature, as from the frequency of its occurrence and importance of its effects. It prevails in cold moist climates, and attacks chiefly children between the ages of seven and fourteen, though it is not unfrequently met with both before and after this time of life. The first symptom complained of is generally pain of the knee, which often exists for months before attention is directed to the true seat of the disease. Sooner or later the patient is observed to walk awkwardly, and less vigorously than usual; and when the circumstances on which this difference depends are investigated, it appears that the affected limb is elongated and emaciated—that the convexity of the hip is flattened, so that the sulcus between it and the thigh is less distinct and more oblique in its direction—and that in standing the foot is advanced a little, with the toe slightly everted, and that the patient does not rest his weight upon it. Pain is now felt in the hip-joint itself, and though aggravated by motion, often becomes more severe from time to time without any such cause of irritation. It is most apt to do so during the night, particularly when the weather is wet and changeable. In this

second stage, the disease remains generally several months. At length the symptoms which have been mentioned either disappear, and the limb recovers its former condition, or they are succeeded by others still more disagreeable. In the latter case the limb becomes considerably shorter than the sound one, its mobility at the same time being much impaired or altogether destroyed, and permanent eversion or inversion taking place. Collections of matter now generally make their appearance, most frequently pointing on the outer side of the thigh below the trochanter major, but occasionally in the groin or hip, and issue externally through openings formed either by ulceration, or artificially by the surgeon. The patient then, after a tedious illness, becomes hectic and dies; or recovers with a stiff anchylosed joint and wasted useless limb.

Such being the insidious and destructive progress of the morbus coxarius, it is evidently of much consequence to ascertain the nature and most efficient treatment of the disease. As opportunities of dissecting the parts in the first and second stages of the morbid process very seldom occur, being confined to those cases in which the patient dies of some other disease, the origin of the evil is still involved in considerable obscurity. Different authorities, accordingly, refer it to thickening of the synovial membrane, ulceration of the cartilages, and inflammation of the bones. But although the second of these opinions is the one generally received in this country, there seems good reason for considering the one last mentioned as nearer the truth. The facts that have been collected by actual examination are in favor of this view, and the symptoms observed externally all lead to the same conclusion. The long-existing pain at distant parts of the limb before any trace of disease at the part really affected can be observed, is strongly characteristic of chronic inflammation in the osseous tissue; the freedom of motion without any crepitus, that continues during the second stage, is hardly reconcilable with either ulceration of the cartilage, or thickening of the synovial membrane; and the perfect state of the joint in cases of recovery is not consistent with the previous existence of disease in the articular surfaces. In the third stage there is unfortunately no want of opportunity for investigation by the knife; but then, as always happens in diseases of the joints which have advanced to suppu-

ration, the whole articular apparatus is so involved in the destructive process that the part primarily affected cannot be recognized. In three cases which I have dissected at the beginning of the third stage—that is, after suppuration, but before the matter was discharged externally—the articular cartilage was sound everywhere, both on the head of the femur and on the acetabulum, except a small portion not so large as a sixpence at the center of this cavity, where it was removed, and allowed a probe to pass into or rather through the bone. That cases of ulceration of the cartilages of the hip-joint do occasionally occur, there can be no doubt, both from the symptoms and dissections that have been observed; but that these bear a very small proportion to those in which the disease originates in the bone, seems no less certain.

The disease may be then regarded as in general consisting primarily and essentially of chronic inflammation in the bones composing the joint, of which the pelvic portion usually suffers more than the femur; and the means proper for subduing it are consequently those which have been found most efficacious in the treatment of such affections of the articular apparatus. When the symptoms are not severe, as is usually the case in the early stage, perfect rest alone is required, though it may be prudent also to apply occasionally a few leeches to the groin. For preventing motion, nothing answers so well as the long splint, applied in the same way that has been advised for fracture of the neck of the thigh-bone, no extension being effected, but merely complete fixture of the limb in a line with the trunk of the body. But if the pain is severe, so as to disturb the patient's sleep, or continues after the means just mentioned have been employed, which is very seldom the case, recourse must be had to counter-irritation; and though the various methods of effecting it by blisters, setons, caustic issues, and moxa are all occasionally beneficial, the actual cautery ought always to be preferred as the most powerful means that can be employed. The best place for applying it is the hollow between the trochanter major and the tuberosity of the ischium, where a broad eschar, several inches in length, should be formed. The patient must be kept perfectly quiet during the cure, which generally requires several months. He seldom experiences much benefit until the slough separates and the ulcer-

ated surface begins to discharge freely. Should there appear any tendency to heal prematurely, it may be easily checked by applying some diluted ointment of cantharides; and if the sore remains open after the diseased action seems to be at an end, some astringent wash, such as the solution of the acetate of lead, should be applied to promote its cicatrization. When the disease goes on to suppuration in adults, the case may be considered nearly hopeless, as caries then almost always ensues, and being seated in a part where excision cannot be performed, inevitably proves fatal to the patient sooner or later. In children the chance of recovery is much greater, but the limb in this case remains small, rigid, and distorted, the toes being turned sometimes inward, sometimes outward. When the head of the femur is little affected, and the ravages of the disease, as usually happens, are chiefly exerted on the acetabulum, the thigh is rotated inward, and presents nearly the same appearance as that which results from ordinary dislocation on the ilium. But when the head of the bone is destroyed by ulceration or interstitial absorption, the various muscles tending to effect rotation outward, being no longer opposed by the usual mechanical resistance, draw the limb into nearly the same position which follows fracture of the neck of the femur, and point the toes outward.

Excision of the Joints.

It has been explained in regard to the treatment of caries, that the only remedy for this condition is removal of the affected portion of the bone. Amputation was formerly regarded as almost the only means of relief from carious joints. But it is now fully ascertained that, on many occasions, the limb may be saved by cutting out the articulation. The softened, discolored, and ulcerated integuments, the thickened and indurated cellular substance, and the gelatinous synovial membrane are found to afford no serious obstacle to recovery, provided the whole of the bone, so far as it is actually carious, be taken away. The operation requisite for this purpose, though severe, is not more dangerous than amputation, because the joint, previous to its performance, has been opened by the disease; the whole of the articulating tissues, which are apt to suffer violent inflammation when irritated,

are either previously destroyed or removed; the great blood-vessels and nerves are not interfered with; and the patient is not subjected to the shock which is caused by taking away a limb.

As to the joints which may be subjected to this operation, it is evident, I think, that the extent to which the acetabulum is almost always affected in the hip-disease forbids any attempt at excision. Though experience has not yet fully decided whether the limbs that might be preserved by cutting out the knee and ankle joints would be preferable to the artificial substitutes which may be worn in their stead, it seems pretty well ascertained that in general they would not. The wrist also, from the number of bones and complexity of articulations entering into its formation, together with the numerous tendons, arteries, and nerves passing over it, does not seem to be favorable for the operation. But the elbow and shoulder joints, while their structure and situation are most convenient for excision, hold out the greatest inducements to effect their removal without performing amputation. In all ranks and circumstances of life, the use of the hand is of great consequence; and even although the elbow or shoulder were to remain stiff and motionless, if the hand could be preserved entire and serviceable by excision of these joints, this would be infinitely preferable to taking away the limb. But it has been proved by numerous facts that, while the joints beyond the disease remain as useful as ever, the one which has undergone the operation may regain such a degree of mobility and subjection to the action of its muscles as to render it hardly distinguishable from a sound one. There is no new joint, strictly speaking, formed, but a strong fibrous substance unites the extremities of the bones, and by its flexibility allows them to move within proper bounds; while the muscles obtain new attachments, so as to perform their usual office, and even the bones regain somewhat of their original form.

Shoulder-joint.—Different methods have been followed in cutting out the shoulder-joint, but it will be sufficient to describe the one which appears to be the most convenient. The surgeon introduces a straight, sharp-pointed knife under the coracoid process, thrusts it down to the head of the humerus, and then cuts perpendicularly, close upon the bone, nearly as far as the attachment of the deltoid. In order to detach the head of the humerus,

he introduces the fore-finger of his left hand into the joint, and using it as a guide for the knife, separates the attachments of the muscles, which are inserted into the greater and smaller tuberosities. The arm being then drawn backward, the head of the bone protrudes through the wound, and being grasped in the hand, may be readily sawn off. The glenoid cavity should next be examined, and if it is found to require removal, the best mode of procedure is to thrust a knife through the posterior part of the deltoid to the neck of the scapula, and then cut downward along its inferior costa until sufficient space is obtained for introducing the bone-pliers, of which the blades may be easily insinuated so as to inclose the whole part that requires to be taken away. This is much better than attempting to dig out the glenoid cavity through the anterior incision.

The only arteries cut during the operation that in general require to be tied, are a branch of the Thoracica humeraria and the anterior circumflex. The edges of the wound should be stitched together, and some light dressing having been applied, the arm ought to be supported by a sling.

The patient need not be confined to bed beyond a day or two, or so long as the fever excited by the operation continues; and when the wound begins to heal, he must gently exercise the limb to prevent it from becoming stiff.

The credit of performing this operation for the first time has been ascribed to Mr. White, of Manchester (1769); but there seems good reason for believing that the case being one of necrosis, not caries, he merely removed part of the exfoliation before it had become detached from the living bone. The patient was a boy fourteen years of age, who "had been suddenly seized about a fortnight before with a violent inflammation in his left shoulder, which threatened a mortification, but at last terminated in a large abscess, which was opened with a lancet a few days before his admission." Through this opening, and another that had formed spontaneously under the acromion process, the *os humeri* could be felt and seen "totally divested of its bursal ligament."

Mr. White made an incision from the acromion process half-way down the arm, protruded the end of the bone through the opening thus obtained, and sawed it off. At the end of two months he found that a large piece of the remaining bone had become loose,

and easily removed it with a pair of forceps. The patient was perfectly cured at the end of four months from the operation. The arm was then not quite an inch shorter than the other, and he had the perfect use of it. In a work published thirty-four years ago,* I expressed my persuasion that this was not a case of caries, as it had generally been regarded, but one of acute necrosis; and the following very curious companion to it, at a more advanced stage, seems strongly corroborative of that opinion.

Thomas Cairns, aged 13, was admitted into the Infirmary on the 30th of June, 1833, on account of a great enlargement of the right shoulder, attended with pain and discharge of matter. It was stated that, ten months before, he had fallen from a wall about four feet high, among loose stones, and afterward had been pretty severely handled by a bone-setter, who alleged that the humerus was broken near the joint. Inflammation and suppuration followed, openings for the discharge of matter took place at various parts, the joint became stiff, and the patient's strength declined. In these circumstances, he was sent to be under my care.

As it was impossible to obtain any satisfactory information in regard to the condition of the joint by introducing a probe, I enlarged the sinuses that led most directly toward it sufficiently to admit my finger, with the point of which the bone was felt bare. The firmness of the surrounding parts prevented a more free examination, but the information thus gained, together with the history of the case, convinced me that a portion of the bone was dead and detached. I therefore extended upward the incision already made, finding it necessary to use for this purpose both the knife and cutting-pliers, and then ascertained that the exfoliation lay loose in a bony case. Being unwilling to remove any of the new-formed osseous substance which was destined to take the place of the old bone, I forcibly dilated the edges of the aperture until the shell gave way sufficiently to permit extraction of the sequestrum. After the principal portion was removed, some small pieces were found lying in the cavity, which proved to be fragments of the dense plate that had formed the convex surface of the head of

* Treatise on the Excision of Diseased Joints, 1831.

the bone. The glenoid cavity of the scapula was divested of cartilage, but covered with a smooth, firm, velvet-like lining. Recovery was delayed by unhealthy action of the sore, which assumed a phagedenic and afterward a sloughing character, but was so far completed on the 7th of September that the boy returned home with an arm not perceptibly shortened, and, though still stiff at the shoulder, nearly as useful as ever. I saw the patient, some years afterward, grown up to be a strong active man.

In 1826 I operated on a shoulder-joint which had been diseased for upwards of seven years, and had reduced the patient, a female between thirty and forty years of age, to the greatest degree of exhaustion. The head of the humerus was completely excavated and carious, and presented a most favorable opportunity for excision. Recovery was soon completed, and for many years afterward, until she died of some other complaint, the poor woman was enabled to lead an active industrious life, with the full use of her arm for all ordinary employments. It should be known that this joint is remarkably distinguished by its liability to suffer from disease in one of the bones composing it, while the other remains free from the same derangement—so that the head of the humerus may suffer from absorption and caries, while the glenoid cavity is no otherwise changed than by the removal of its cartilage. This important peculiarity, until lately, did not admit of any satisfactory explanation, but has had some light thrown upon it by a case in which I found the coracoid process of the scapula and the head of the humerus suffering from disease, while the glenoid cavity was free from it, there being at the same time reason to believe that inordinate contraction of the biceps had been the cause of derangement. As the shoulder-joint is distinguished from all others by its anatomical structure in respect to the long head of the biceps passing through it, the peculiarity of pathological condition in question may therefore with some reason be attributed to this source.

Elbow-joint.—In excision of the elbow-joint it is necessary to expose the articulation freely, and with this view the integuments may be divided, either by a single longitudinal incision—as Mr. Park originally proposed—or in the more complicated form adopted by the Messieurs Moreau, which was like the letter H, the transverse cut being from side to side along the upper edge of

the olecranon. The latter method is that which, until lately, I have employed, and performed hundreds of times with the most satisfactory result. It certainly is the easiest mode of procedure, but the former plan has a decided advantage in regard to the after-treatment, from not being exposed to the inconvenience which attends the transverse incision, if it does not heal by the first intention and allow the edges to separate. If, therefore, the circumstances permit its performance, the simple longitudinal incision should be preferred, especially in cases of anchylosis, where there is a great tendency to secondary hemorrhage, and consequently much risk of primary union being prevented.

The integuments in either of these ways having been separated from their subjacent connection, and the ulnar nerve held aside, the olecranon should be removed by the cutting pliers, and then the lateral ligament at the radial side of the joint having been divided, the knife may be safely passed round the extremity of the humerus so as to let the saw be applied a little above the tuberosities, after which, the radius and ulna being similarly exposed, should have their extremities removed on a line with the lower edge of the coronoid process. Any vessel that requires a ligature should then be tied, and the edges of the wound having been retained together by silver sutures, a roller is to be applied in the figure of 8 for giving the requisite support, which it does much better than any sort of splint.

In determining the extent to which it is necessary to remove the bone, the truly carious part must be carefully distinguished from the rough and thickened state of the neighboring bone, which depends upon the effusion of new osseous substance in consequence of the disease causing irritation. When we read of the humerus being cut out to the extent of *four inches*, it may be safely concluded that this discrimination has not been duly regarded.

The cases admitting this operation are much more frequent than those proper for excision of the shoulder-joint. Having adopted the practice when it was almost entirely neglected in this country, and employed it very extensively as well as successfully, I feel great pleasure in contemplating the benefit that has been derived from its introduction into general use. I have also employed it with great advantage in cases of anchylosis both from disease and

injury. In such cases, after the flaps are reflected so as to expose the bones, their union should be divided by the saw, after which each of the ends may be readily removed to the extent requisite.

CHAPTER XIII.

MUSCLES.

Injuries of Muscles.

THE muscular tissue is not by any means prone to diseased action, and in general suffers little irritation from the injuries to which it is subjected.

WOUNDS.—An incision in the long direction of a muscle occasions very little inconvenience, and the wound heals without any remarkable difference from one confined to the integuments. But if the muscular fibers are divided transversely, their contractility causes a separation of the sides of the wound, more or less considerable according to circumstances. No new muscular substance is ever formed to supply the defect, and it consequently remains permanent, the intermediate space being occupied by a dense fibrous substance. The muscle concerned is for a time rendered weak in action, owing to the relaxation of its fibers; but in general it gradually becomes accommodated to the change, and acts with its former vigor.

In order to prevent this separation of the cut extremities as much as possible, the patient should be made to assume such a position as will most effectually relax the injured muscles. Sutures would have little effect in counteracting the retractile tendency, and it is not thought right to employ them lest they should excite irritation. Punctured wounds of muscles are frequently followed by diffused inflammation and extensive suppuration; but these effects are to be ascribed to the form of the wound, and the thick fascia which it generally penetrates before reaching the muscle. In gunshot wounds, and extensive laceration of the muscular

texture, a troublesome degree of swelling is apt to proceed from expansion of the soft or vascular substance concerned, and requires the pressure of carefully-applied bandages.

Rupture and Strains of Muscles by their own Action.—The complete rupture of a muscle by the overaction of its own contractile power is an extremely rare occurrence. Instances of it have, however, been observed in the recti muscles of the abdomen and *rectus femoris*. The symptoms are sudden inability to perform the accustomed motions, and a vacuity perceptible on external examination of the part affected. The treatment consists in approximating the ruptured extremities as much as possible by the position of the patient and by bandaging. When the parts become consolidated, the usual power is regained.

Partial rupture of muscles from violent exertion is far from being uncommon. The situation in which it occurs most frequently is the calf of the leg, where the *soleus* is apt to have some of its fibers torn during the extension of the ankle-joint. This is more apt to happen from an inadvertent than a voluntarily violent exertion, and generally occurs without the patient being aware of making any effort. The symptoms are a sudden sensation similar to that which would be caused by a blow on the injured part, succeeded by severe pain, and inability of using not only the muscle injured, but also those associated with it in action, together with swelling and ecchymosis of the limb. The treatment consists in maintaining perfect rest, using warm fomentations while the pain continues, and then applying moderate pressure by means of a bandage, together with lotions or liniments, such as the solution of acetate of lead with opium, or the tincture of soap and opium. The cure is more or less tedious according to the extent of the injury, and requires from a few days to as many months for its completion.

Strains without rupture are not unfrequently occasioned by violent muscular action. The patient suffers severe pain at the injured part, and is unable to perform almost any motion with the affected muscles. In a day or two the pain subsides; but weeks often elapse before the original strength is regained. This accident is most apt to happen in the loins, where the long muscles of the back are subjected to violent exertion in lifting heavy weights, etc. The treatment requires in the first instance repose,

warm fomentations, and sometimes the local abstraction of blood. After the pain has ceased, or has lost its intensity, friction with some stimulating liniment, and the support of a flannel bandage, are the best means that can be employed.

Dislocation of a muscle is met with only in the case of the *latissimus dorsi*, and here very rarely. The portion of this muscle which lies over the inferior angle of the scapula and braces it to the chest, seems, especially in weak relaxed individuals, so loosely connected with the bone that a very slight force would be sufficient to cause its displacement downward. Such a dislocation does accordingly sometimes happen, but so seldom that few practitioners have an opportunity of seeing more than one or two instances of it. The accident is easily recognized by the projection of the lower extremity of the scapula, particularly when the arm is raised or separated from the side. All attempts to replace the muscle in such cases have proved unavailing. And the only remedy that can be advised is a bandage to press down the bone and promote the formation of new adhesions between it and the muscle.

Derangements in the Nutritive and Functional Actions of Muscles.

It has already been observed, that the muscular tissue is little disposed to morbid action, and though diseases sometimes extend into it from the neighborhood, there is no part of the body in which alteration of structure so rarely originates. The carcinomatous and medullary sarcomatous degenerations sooner or later engage every structure that lies near the one in which they originate, and the muscles are not spared. Scrofulous tubercles occur in every tissue, but are rarely met with in the substance of muscles. Fibrous tumors have been met with in the muscles, but still more seldom.

Absorption sometimes occurs in muscles so as to occasion an atrophy or wasting of them. This occurrence may be confined to a single muscle or affect a whole group of them. It is generally induced by some irritation, as that of a blow or irritating wound. The pricks sustained in dissecting have led to such consequences. There does not seem to be any efficient means

of preventing or removing this morbid action when it has commenced.

The functional action of muscles depends very much upon the nervous system; and derangement of it is to be regarded, in general, rather as symptomatic of changes in the condition of that important system, than indicative of any alteration in the organs with which it is more immediately connected.

It sometimes happens, however, that inordinate disposition to contract, and also in other cases deficiency of contractile power, are met with, when the muscles themselves appear to be the seat and cause of the disease. One muscle, or a group of muscles, occasionally contracts with unusual energy, and either without any, or with very imperfect, intermissions of relaxation. A permanent deformity or unusual position of part of the body is thus caused, which becomes increased in degree from time to time owing to paroxysms of contraction. These paroxysms are extremely variable in their frequency and duration. They often occur without any assignable cause, but are usually induced or aggravated by irritations, whether of body or mind. The muscles affected in course of time enlarge, and project more than is natural; they are also the seat of uneasy sensations, and are painful on pressure. This morbid action of the muscles is most frequently met with in the neck, especially in the sterno-mastoid. It then occasions one kind of wry-neck, the head being turned habitually to the opposite side.

The treatment of this disease consists in removing all sources of irritation, whether direct or indirect, that may be discovered to be in operation. The state of the various secretions ought to be carefully inquired into, and rectified if deranged. If there are symptoms of local irritation, leeches, warm fomentations, and anodyne liniments should be applied over the seat of the disease; and if these means fail, blisters and acupuncturation may be tried.

Single muscles, or groups of muscles, are more frequently met with in the opposite state to that which has just been described, their power of contracting being much diminished or altogether lost. The muscles of the face and fore-arm are most subject to this affection, and they suffer from it variously, both as to degree and extent. At one time it is the flexors alone, at another the extensors, and in some cases both together, which lose the power

of action. The cause of this condition is sometimes a blow, when the cure is usually tedious and imperfect. All that can be done is to use fomentations, frictions, and persevering attempts to exercise the muscles. The causes more frequently concerned are exposure to cold and long-continued pressure, and both of these often seem to be conjoined in producing the effect; as the most common history of the disease is, that the patient fell asleep in the open air, or in some unusual situation, and rested his head on one arm. In such cases, the cure is in general readily accomplished by applying a succession of blisters along the course of the affected muscles.

Contraction of Muscles—Club-foot—Wry-neck—Strabismus.

In addition to that temporary or spasmodic contraction which has been already mentioned, the muscles are liable to a permanent shortening of their natural length, necessarily producing deformity, as well as causing inconvenience from restricting motion. Such contractions of the muscles are occasionally congenital, as in the common case of club-foot, which depends not upon any faulty conformation of the bones, but upon a want of due balance in the muscular powers of the limb. In general, the foot is turned inward (*Varus*); but sometimes, though very rarely, it is found in the opposite direction (*Valgus*). The foot may also be maintained in a state of extension without any lateral inclination (*Pes equinus*); but this condition is hardly met with as a congenital derangement, and usually occurs in childhood, especially during the period of teething, or after an attack of the exanthematous diseases to which that age is liable.

Until recent years, the treatment of club-foot, in all its forms, was limited to the employment of various apparatus with the view of counteracting the muscles by mechanical force, and gradually elongating them so as to remedy the distortion. This process was excessively tedious, expensive, and too frequently, with every care, imperfect in its effect. Hence the number of adults to be seen everywhere, especially in the lower ranks of life, retaining the bones of their limbs in a perverted position, until, becoming altered in their form, they constitute supports for the body of very defective utility and no less unseemly appearance.

A great improvement has been introduced into practice by surgeons of the present age, particularly Stromeyer and Dieffenbach. It consists in dividing the tendons of the contracted muscles by subcutaneous incision, and thus at once removing the grand obstacle in the way of treatment, which, when this has been done, merely requires such a degree of mechanical support as may compensate for the state of contraction and relaxation in which the ligaments necessarily remain for a time. The sooner the operation for this purpose is performed the better; but it may be undertaken without impropriety so long as the bones have not suffered such an alteration of form as must render them unfit for assuming their natural position. This is more especially the case in simple extension of the foot (*pes equinus*, or pointed toe), which may be remedied in apparently the most confirmed degree, provided the astragalus is not displaced so very far forward that it does not admit of being returned into its proper position.

In dividing the tendons, instruments of various shapes and sizes have been employed. The knife should have a very small and narrow blade, with blunt back. An assistant should hold the foot so as to stretch moderately the tendons about to be cut, and then the operator, pinching up the integuments lying over it with the thumb and fore-finger of his left hand, introduces the knife with its flat edge between the skin thus elevated and the tendon. The integuments being now left free, the cutting edge is directed upon the tendon, and by a slight sawing motion, aided with pressure on the back of the blade, readily completes the section. A sudden snap, or absence of previous tension, distinctly denotes when this has been effected. A piece of dry lint is then to be applied on the puncture; and to insure healing of the wound it is prudent to afford the support of a pretty long bandage with the view of preventing motion. At the end of two or three days the foot may be placed in the boot provided for it. The best apparatus of this kind is merely a strong boot made of bend-leather—moulded into the requisite form while moist—and may be employed with great advantage as a substitute for the more complicated machines in common use.

As to the selection of tendons for division, the circumstances of the case must of course be the guide. In *varus* the tendo Achillis, *tibialis anticus* or *posticus*, and in *valgus* the *peronei*,

are most frequently in fault. But in *talipes* or *pes equinus* nothing more is required than division of the tendo Achillis. Indeed, favorable cases of the last-mentioned kind are remedied almost at once by this operation, without the assistance of any mechanical means; since the action of standing or walking is of itself sufficient for restoring the limb to its proper shape, so soon as the opposing muscular contraction is removed. In one remarkable case, where both feet were affected, the patient, a young man who was about to sail for Australia, walked without any assistance before the end of a week after I had divided the tendons.

Wry-neck.

The sterno-mastoid muscle occasionally becomes contracted, and causes a very awkward distortion, the head being drawn toward the clavicle on the side affected, while the face is turned in the opposite direction; and unless relief be soon afforded, the trunk is apt to suffer a degree of lateral curvature, from the want of due balance at its upper extremity. Attempts to remedy this deformity, by division of the muscle, were made at an early period; but being effected by free incision of the integuments, proved severe in their execution, and unsatisfactory in their results. In 1831, I thought of performing the operation in the way of subcutaneous incision, by means of a knife so narrow-bladed as merely to puncture the skin. The patient was instantly and completely relieved, without any pain or subsequent inconvenience. It appears that nearly at the same time Dieffenbach had adopted this method, and that ten years earlier it had been practiced in one case by the late M. Dupuytren. Every case of wry-neck that has come under my care since the one just mentioned, I have treated in this manner with invariable success. I have seldom found it necessary to divide more than the sternal portion of the muscle, at the distance of an inch above the clavicle. No dressing or indeed after-treatment of any kind is required, since the distorted parts soon regain their natural position.

Strabismus.

Strabismus or squinting has always been known to depend upon unequal action of the recti muscles of the eyeball, and the idea of affording relief by their division has occasionally presented itself, though not until lately carried into effect. It was only in 1838 that Dieffenbach first performed this operation with success, and since that time it may be said, without exaggeration, to have been repeated in thousands of cases. The procedure being new, was eagerly seized upon by the youngest and least experienced members of the profession as an unappropriated territory, which might be made their own through the claim of early possession, and the public made to believe, by newspaper advertisements and the titles of trumpery pamphlets on the subject, that the operation was somehow different in its nature from the ordinary practice of surgery—not requiring for its proper performance the usual qualifications of experience, dexterity, and judgment—and best exercised by persons having no claim to confidence in any other department of the profession. The consequences may be readily anticipated. No discrimination of cases being made, and no difference in the treatment adopted according to the variety of circumstances, while the fundamental doctrine of invariable success opposed that fair statement of the results which might have tended to improvement, frequent failures, and the loss of not a few eyes, have brought the operation into a considerable degree of discredit. Having had occasion to divide the muscles for squinting very extensively in that class of patients which permitted me to watch the progress and ascertain the final issue of the treatment, I feel entitled to express a highly favorable opinion of the operation, provided it be conducted on proper principles; and these I will now endeavor to explain.

Strabismus is not a congenital derangement, as used to be thought, but commences during infancy or the early years of childhood. It frequently seems to be connected with some of the febrile affections incident to this age; and though often met with in several members of the same family, cannot justly be attributed to imitation. The obliquity is for the most part confined to one eye, and when both are affected, they suffer alternately. In a

very large proportion of cases the eyeball is turned inward to the nose, so that the leer or outward squint is not seen, I should say, more than once in fifty cases. Squinting is not only unseemly in appearance, but usually attended with more or less deficiency in the power of vision,—the patient being seldom able to read or distinguish any minute objects with the affected eye. This was formerly thought to cause the complaint, but is now ascertained to be its effect, and to depend merely upon the inability of attending to the different impressions made on the eyes at the same time, so that one of them being habitually disregarded, the organ ceases to be serviceable. A lady who squinted inward with both eyes alternately found that she saw distant objects best with one, and near ones with the other. A gentleman who squinted outward with both eyes alternately complained that, in driving, he felt great difficulty in avoiding obstacles from inability to judge accurately of distances. If the eyes are restored to their proper directions at an early age, the vision of both usually becomes perfect; but in elderly persons there is seldom more than a partial improvement.

The internal or external *recti* muscles occasion the obliquity, but do not effect this, as in the case of club-foot or wry-neck, by permanent contraction. The patient can usually render the eye straight by a voluntary effort, and whenever the sound one is closed, the other ceases to squint; but, if the eyelids are then suddenly opened, the eye, however straight it may ordinarily be, is found completely inverted or everted, just as the squinting one was previously. From this very curious fact it would appear that the complaint depends upon an alteration, not in the texture or length of the muscle, but in its disposition to contract, or rather in the disposition to contract possessed by the two corresponding muscles, and consequently, that if advantage is to be derived from division of the muscle, that of either the straight or the squinting eye may be subjected to the operation. Another inference of practical value is, that in cases where complete relief has not been afforded by cutting the rectus of the squinting eye, the corresponding muscle of the other eye may be divided with advantage. In confirmation of the derangement depending rather upon functional than organic alteration, it may be added that most persons laboring under the complaint remark that it varies in degree with

a variety of circumstances, but especially disturbance of the digestive organs. *A priori*, therefore, it might have been expected that division of the *recti* would not afford complete, or, at all events, permanent relief, since, if the tendency to contraction remained, it would reinduce obliquity so soon as the muscle acquired new attachments to the sclerotic, just as has been ascertained to happen in the spasmodic form of wry-neck. Experience, however, having happily ascertained that the operation does in general prove effectual, the theoretical objection must not stand in the way of its employment; but may account for the failures as well as relapses occasionally met with, and afford encouragement to repeat the division when it does not give all the relief desired at once.

The operation essentially requires an opening of the conjunctiva sufficiently extensive to expose the insertion of the rectus in fault, and a complete division of the muscle at this part. Various methods have been recommended for effecting this, by the use of hooks for catching the muscle as it lies in the loose texture of the orbit; but the procedure consisting in a simple secure dissection of the part, without any hap-hazard diving, has always seemed to me greatly preferable to any such uncertain and dangerous artifices. I have always, with the exception of some experimental trials in the early part of my experience, performed the operation in this way, with some little modification, and will now describe the mode of conducting it.

The assistant should separate the eyelids by means of a speculum, and keep the eyeball everted by double-pointed hooked forceps. The first step is to raise a fold of the conjunctiva by means of the forceps applied close to the caruncle, and with the scissors cut it in a vertical direction to the extent of about half an inch in the middle line between the forceps and hook. The attachment of the muscle, being then distinctly exposed, is divided by successively cutting with the scissors portions of it raised by the forceps, just as in dissecting this part in a dead body. The after-treatment requires no particular attention beyond a moderately abstemious regimen,—avoiding bright light,—exercising the eyes equally,—and not employing them in reading or any minute work. At the end of ten days or a fortnight, if any obliquity is found to remain, or to have returned, it will be a question whether the

rectus of the other eye should be divided, or the muscle already operated on should be cut a second time. In deciding as to this, I think the best guide is the effect produced by closing the sound eye. If it is found to be altered in its position by doing so, and to present obliquity when suddenly exposed by opening the eyelids, the rectus concerned in producing this effect may properly be divided. But if it remains straight, the operation should be repeated on the squinting eye, in the hope that the antagonist muscle, being afforded a second opportunity of contracting, will do so more effectually than on the first occasion. In the course of two or three weeks after the operation, a warty-looking excrescence frequently grows from the seat of the wound, and requires to be cut away by dividing its neck, which is small and almost thread-like, with a pair of curved scissors; or, to render this unnecessary, the nitrate of silver may be applied occasionally until the conjunctiva is completely healed. If left to itself, the growth, after gradually indurating, ultimately drops off from atrophy of the nutrient vessels.

CHAPTER XIV.

TENDONS.

Injuries of the Tendons.

WOUNDS.—Tendons are sometimes divided by cutting-instruments, the immediate consequence of which is loss of power of the muscles concerned. It was formerly the custom to sew the cut surfaces of the tendon together; but this practice is now abandoned, and the only means employed in addition to those which the wound of the integuments requires, consists in careful attention to the position of the limb, in order to relax the muscle connected with the injured tendon and prevent as much as possible the separation of its extremities. When the tendon is of large size, such as the *tendo Achillis*, lateral compresses are useful in

keeping the surfaces opposed to each other. It is ascertained that though the extremities remain considerably distant, they are still united together through the medium of a new-formed substance, the result of an interstitial process of reproduction. This part is sometimes thinner, sometimes thicker, than the original tendon, but always inconvenient by causing relaxation of the muscle and consequent diminution in the effect of its contractile power. The surgeon, therefore, should do everything in his power to render the bond of union as narrow as possible. In cases where the wound has been allowed to heal, with such separation of the extremities of the tendon as renders the patient lame, it may be warrantable to cut out the intermediate substance and sew the ends of the tendon together, as I once did with success in a case where the *tendo Achillis* had been divided and allowed to heal with great retraction.*

Rupture.—Tendons may be torn either by external violence, or by inordinate contraction of their own muscles. In the former case, they are most apt to give way where the muscular fibers are attached to them, and it not unfrequently happens that the tendons of the penniform muscles of the fingers or wrist are drawn out to the extent of five or six inches. It might be expected that great irritation and diffused inflammation would result from such injuries, but the wound in general heals kindly, as if not complicated with any unusual peculiarity. It is a prudent precaution, however, to oppose the commencement of inflammation by using cold applications in the first instance; and if it should occur, incisions, together with warm fomentations, if the symptoms are violent, and the latter means alone if they are moderate, will be proper. When suppuration is established, compression along the course of the sinus, stimulating washes, and bandaging are required.

Tendons are more frequently ruptured by the too energetic action of their muscles. The tendo Achillis is most liable to this accident, and, indeed, with the exception of the tendon of the extensors of the thigh, is almost the only one in which it occurs. It has been supposed that the thread-like tendon of the plantaris may be ruptured without a corresponding injury of the great

* Ed. Med. and Surg. Journal. Report of Surgical Cases, 1835.

tendon of the ankle, and that such is the case where patients suddenly, after exertion, lose the power of extending the foot while no vacuity can be felt in the course of the tendo Achillis. But there can be little doubt that on such occasions the injury sustained is rupture of the muscular fibers, probably of the soleus. It is difficult to conceive that the loss of so small a power as that of the plantaris muscle should render the patient unable to move the ankle; and the pain, discoloration, and tedious recovery which are usually observed to attend cases of the kind in question, are additional grounds for believing that the injury is seated in the muscular tissue.

The *tendo Achillis* is usually ruptured in consequence of some sudden exertion in raising the body or preventing it from falling. The patient feels a sensation as if struck with a blunt weapon. It seems to him that his heel has sunk into a hole, and a noise as of a cord giving way is occasionally heard, both by him and the by-standers. When the limb is examined, a hollow may be felt at the part where the tendon is torn, owing to the retraction of its extremities. The patient, by means of the deep-seated extensors of the ankle, retains the power of extending the foot slightly when there is no resistance except its own weight, but cannot do so with any considerable force, such as is required in walking. Strong adult males are most subject to this accident.

The treatment consists in bending the knee, and extending the ankle so as to relax the gastrocnemius as much as possible, applying lateral compresses at the injured part to keep the ends of the tendon in proper position, and supporting the limb with a bandage. Various contrivances have been employed to maintain the requisite posture. Of these the slipper and calf-piece of Monro I. may be first mentioned.

The calf-piece Dr. Monro compares to the article of dress which jockeys wear to connect their breeches and boots, differing only in so far that it is made to lace on, instead of being buttoned. By means of a strap and buckle, the heel of the slipper can be drawn up to this bandage and secured, so as to effect permanent extension of the ankle. Petit used a similar apparatus, with this difference, that the strap coming from the heel of the slipper was fastened to a collar surrounding the thigh above the knee, which had the advantage of keeping the knee bent, as well as the foot

extended. This seems, on the whole, to be the best method, and an apparatus sufficiently effective for the purpose may be readily constructed extemporaneously, or a splint may be applied on the front of the ankle to keep the foot in an extended position. Compresses of lint should be placed on each side of the tendon at the ruptured part. In the course of three or four weeks the reunion is completed; but it does not become strong enough to resist much force until a considerably longer period has elapsed, during which the patient should be cautious in using the limb, and, as a precaution against straining the tendon, wear a high-heeled shoe.

Inflammation and Sloughing of Tendons.

The tendons, their fibrous sheaths, and also the fasciæ which lie over them, are very readily deprived of vitality by inflammation. This occurrence most frequently happens in the fingers and palm of the hand in what is called Paronychia or Whitlow. By this term is understood an intense inflammation, generally confined to one finger, but sometimes affecting several, and extending into the palm of the hand, to which also it is occasionally limited. Though the swelling is generally on both sides, the principal seat of disease is almost always confined to the palmar aspect. The pain is agonizing, the tension great, and the redness of the skin affected very bright. The inflammation extends to various depths, and leads to consequences of corresponding importance. Sometimes there is merely a collection of matter found under the thick skin of the part affected. More frequently, in addition to this, there is more or less sloughing of the tendinous structure, and not rarely death of the phalanges. The causes of paronychia are generally local irritations, but it is probably necessary that their effect should be favored by a state of the system predisposing to derangement. The only effectual treatment consists in making a free incision through the tense and swollen parts. There is reason to believe that if this were done soon enough, it would generally prevent the subsequent suppuration and sloughing; but the opportunity of interposing thus early is seldom afforded, and the incision is usually practiced to evacuate matter. Much mischief is often done by continued poulticing in such cases. Under this influence the matter is long of making its escape by ulcerative

absorption, and the opening, when at last formed, is always too small for allowing free exit either to it or the tendinous sloughs. The irritation, therefore, is kept up, especially by the retained sloughs of the tendons, and the destruction of the tissues proceeds. There is no advantage in poulticing previous to incision, and though useful for a day or two afterward in promoting the separation of the matter and sloughs, it ought not to be persisted in longer than this, as lotions with pressure are much more beneficial. When the tendons slough so extensively as to render the finger rigid and useless, amputation is the most prudent course; and the patient will generally decide upon it after being made fully acquainted with the reasons for its performance. The distal phalanx often dies, along with a portion of the tendon, but the extremity of the finger ought not to be removed on this account, as it is of great consequence to preserve the secreting organ of the nail, which renders the finger, though shortened, little less useful or seemly than it was before.

Ganglion.

By Ganglion is understood a tumor connected with a tendon, composed of a bag containing a glairy fluid, and varying in size from that of a pea to that of a pigeon's egg. There is a difference of opinion as to the nature of ganglions, the question being whether they are entirely new formations, or merely developments of the natural serous structure connected with the tendons. Though arguments might be adduced to support the former of these opinions, it seems on the whole more reasonable to adopt the latter.

The bags vary greatly in thickness, and their contents are no less dissimilar in respect of consistence, being sometimes perfectly watery, but in general glairy like the white of eggs. The disease occurs most frequently at the wrist and ankle, the extensor tendons of the fingers and toes being affected. Females are more liable to it than males. It seldom produces inconvenience, except from the deformity which it occasions, but sometimes the patient complains of weakness in the limb. It is generally referred to overexertion, but there is nothing certainly known as to the causes of its production.

The most simple and effectual mode of treatment is to rupture the bag by pressure applied externally, and force its contents into the surrounding cellular texture. For this purpose some recommend that the ganglion should be struck a smart blow with a book or similar body; but this is a violent and uncertain method, and it is much better to exert a steady pressure on the tumor by means of both thumbs acting in concert. To promote absorption, a compress and bandage should be applied for some days after the operation. If it should be found impossible to rupture the bag, owing to its strength, the best plan is to introduce a narrow sharp-edged instrument through the skin and open the sac, after which its contents may be squeezed into the cellular substance, or discharged externally. The instrument used for this purpose may be a common surgical needle, or a small tenotomy knife. To make the effect more certain, a blister ought to be applied immediately after the contents of the bag have been evacuated. Such being the different methods of treatment which will be found most effectual and sufficient for the remedy of the disease in all its forms, it would be useless to detail the other measures which have been recommended, and are still occasionally employed. Of these, continued pressure, effected by means of a piece of money or similar solid compress fastened over the swelling, repeated blistering, inunction of tartrate of antimony ointment, seton, incision, and excision are the most deserving of notice, but, for the reason mentioned, need not be more particularly considered.

Bursæ Mucosæ.

The *Bursæ Mucosæ*, like other serous structures, are subject to dropsical effusion. The exciting cause is usually some local irritation; and when of an indirect kind, such as cold, its effect in producing the disease seems in general referable to a predisposition of the system, depending on weakness or some peculiarity of constitution. If the membrane is merely distended, and has not suffered any thickening or alteration of structure, blistering, succeeded by pressure, may induce absorption of the fluid. If the sac is thick and indurated, these means often prove insufficient, and it is found necessary to puncture the swelling so as to let its contents escape, after which, a blister having been applied, and

followed by pressure, the radical cure is accomplished. Sometimes, along with the fluid, the sac contains a number of loose bodies, appearing to consist merely of indurated lymph. They are of a yellow or brownish color, tough consistence, and variable size, from that of a millet-seed to that of a field-bean. It is obviously necessary that, in such cases, the puncture must be large enough to let the bodies escape, after which the treatment ought to be conducted on the principles already explained. The lymph which is effused from the inner surface of the bursa sometimes becomes organized in the form of thick bands stretching across the cavity. In such cases, after the means for producing absorption have been tried and failed, the disease must be removed by the knife.

Bursæ, whether in a sound state or one of chronic disease, are subject to acute inflammation in consequence of local irritation, especially that of bruises. The symptoms are severe pain, aggravated by pressure or motion, bright redness of the superjacent skin, and more or less swelling. The inflammation usually terminates either in resolution or effusion of lymph or serum, but sometimes goes on to suppuration. The surrounding cellular substance then also becomes inflamed, and a diffused abscess is the result. Leeches, warm fomentations, and lotions of acetate of lead with opium, are the best means for subduing the inflammatory action, but when matter is formed, a free incision should be made without delay. After the suppuration of a bursa a troublesome sinus may remain, and harass the patient by frequent exacerbation of the symptoms. Free dilatation is for the most part sufficient in such cases; but should it not prove to be so, the surface of the cavity must be touched with caustic.

The particular bursæ which most frequently suffer the different diseased conditions that have been described, are those of the flexor tendons of the fingers, and those seated over the olecranon, patella, and ball of the great toe. In the first of these situations, the bursal sheaths, which accompany the flexor tendons of the fingers from the fore-arm into the hand, are liable to thickening of their texture, with distention from effusion of fluid and the formation of movable bodies, apparently composed of indurated lymph; the wrist and palm of the hand become greatly distended, and the patient loses the use of the limb until the disease is

remedied. Although this condition does not materially differ from that of other bursal sacs, which, when so deranged, yield without much difficulty to remedial treatment, it has proved peculiarly obstinate under the means of remedy formerly in use, and indeed was regarded as nearly, if not altogether, incurable. Blisters and similar applications produced little or no beneficial effect, and puncturing the tumor where most prominent in the wrist or palm afforded no permanent advantage, as the wound either continued to discharge, or closed without obliteration of the cavity. The last patient treated thus in the Royal Infirmary died from the protracted local and constitutional disturbance so excited; and this case led me to reflect seriously on the subject, in order to discover the cause of obstinacy and devise a safer remedy.

The only peculiarity that I could notice was the constriction caused by the annular ligament, above or below which the opening had always been made, and which might perhaps so interfere with the healing process as to occasion the obstinacy in question. In this view of the matter, it appeared that the proper site for an incision was at and through the ligamentous arch itself. I took the earliest opportunity of trying the effect of such a procedure, which was so satisfactory as at once to establish the operation. Its results in my own practice, and that of others, have, so far as I know, been uniformly successful.

The easiest mode of operation is to puncture the swelling a little above or below the annular ligament, then introduce a blunt-pointed curved bistoury under the arch, and, lastly, divide it together with the superjacent integuments. Light and superficial dressing are sufficient in the first instance; and if the swelling does not speedily subside, one or two blisters may be applied.

The superficial bursa lying over the olecranon is subject to irritation and acute inflammation from blows, but not unfrequently suffers an accumulation of fluid with thickening of the membrane, and sometimes also with the formation of internal crossing bands, from organization of effused lymph. The bursa over the patella is very often distended with fluid, and thickened so as to constitute what is called Ganglion of the Knee. It is met with most frequently in persons whose occupation leads them often to rest their weight upon the knee. The bursa over the ball of the great

toe, when irritated by the pressure of a tight shoe, lays the foundation of that painful and unseemly swelling named Bunion. The parts adjacent become thickened and indurated; the bones of the joint enlarge, and in process of time suffer a sort of sublux-ation; and the bursa being thus projected more and more against the shoe, is kept in a state of continual excitement. Dropsical effusion, thickening of the membrane, and suppuration with obstinate sinuses may ensue. It is therefore proper, by the timely application of leeches or lotions, and the removal of pressure, to subdue the disease in its infancy.

Though the deep-seated bursæ have long been well known to anatomists, and regarded by surgeons as the seat of morbid derangements, those which lie superficially under the integuments are of comparatively late observation, and the swellings, as well as other local affections which proceed from their diseased condition, have been ascribed to entirely new formations. In club-foot, for instance, the bursal sac, which in some measure protects the *malleolus externus* when the weight of the body rests upon it, is not, as has been alleged, a production entirely the result of circumstances, but merely the development of a structure naturally belonging to this part. The superficial bursæ seated over the joints of the fingers and toes, of which views are given in the work of Schreger, though almost wholly overlooked, deserve great attention in consideration of the effects which attend their injuries and diseases.

CHAPTER XV.

THROAT.

Wounds of the Throat.

When self-destruction is attempted by cutting the throat, the wound is generally inflicted transversely near the *os hyoides*, sometimes above, but more frequently below it. There is usually an extensive division of the integuments, which are occasionally the only parts injured—and when the injury penetrates deeply, it almost always extends into the pharynx. Sometimes an opening is made into the larynx, and in a few rare cases the trachea is cut, either alone or together with the œsophagus. The great blood-vessels are very seldom injured, from the force of the incision being spent in dividing the tough substance of the pharynx and air-passage, from the part of the throat which is chosen for the purpose, and from the position in which it is held while the knife is applied. When they are opened, it is usually by a sharp-pointed knife being thrust directly down upon them.

In considering the treatment of cut-throat, it is necessary to distinguish between—1, those cases in which an opening is made above the *rima glottidis;* 2, those in which it is below the *rima glottidis*, but does not extend to the œsophagus; and 3, those in which the œsophagus is wounded.

When the aperture, as usually happens, is above the orifice of the larynx, the dangers to be dreaded, in the first instance, are the entrance of blood into the trachea during respiration, owing to its accumulation in the pharynx, and the escape of food through the wound during deglutition. To obviate the former of these, the cut edges should not be brought together until the bleeding from them has entirely or nearly ceased; and with the same view the patient should be made to lie on his face or side, so as to favor the exit of fluids from the wound. If the injury of the pharynx

is not very extensive, it will hardly be requisite to employ any measures to assist the entrance of the food into the stomach, since the whole of what is attempted to be swallowed will not pass through the breach, and it is not to be desired that the diet should, for some days at least, exceed the limits of extreme moderation. But if the aperture is large, so as to admit one or more fingers, it will be prudent to introduce a tube, such as a flexible catheter, into the œsophagus, to serve as a channel for the conveyance of fluid articles of nourishment, until the wound contracts sufficiently to render this unnecessary. The tube may be passed either by the nose or mouth, and also through the wound. When passed by the nose it may be allowed to remain, and is not liable to displacement; but its introduction is extremely difficult, unless the surgeon takes advantage of the opening into the pharynx to direct the point of the instrument, which otherwise is apt to enter the *rima glottidis*, or engage itself in the lining membrane above the orifice of the œsophagus. When the tube, if judged necessary, has been introduced, and the hemorrhage is suppressed, the edges of the wound should be brought together by stitches, while the head is bent forward, and retained in this position by a bandage or other means. The tube may be safely allowed to remain for several days; but if retained during the whole period of healing, which may extend over many weeks, the irritation produced by its pressure, though perhaps not much felt by the patient, is apt to occasion ulceration of the mucous membrane, with abscess, or even exfoliation of the cartilages. After the first week, therefore, nourishment should be afforded either by the power of deglutition still possessed, or by the temporary introduction of a tube into the œsophagus through the mouth.

When there is a wound into the air-passage alone, a tube is not required, unless the breach in the larynx or trachea is so large as to make it desirable to prevent the action of swallowing, in order to guard against displacement of the edges of the wound. If the preternatural aperture is allowed to remain open, the *rima glottidis* has a tendency to contract, and even to close altogether. It may be possible, when such obliteration or straightening has occurred, to widen the passage sufficiently for the performance of its office by introducing bougies from below upward; but such a procedure is extremely difficult and uncertain, and the necessity for

having recourse to it should therefore be avoided by carefully promoting early closure of the wound.

In cases where the œsophagus is cut, the patient must be fed through a tube, unless the opening in the coats of the canal should be so small as to render this unnecessary.

The medical treatment of cut-throat is always extremely important. There is generally great cerebral excitement—the desire for self-destruction frequently continues in operation—and the profuse hemorrhage which sometimes happens exposes the patient to the danger of excessive reaction. It should be recollected also, that the irritation of the wound may occasion swelling of the pharynx, and other deep-seated parts of the throat adverse to free respiration, and may lead to bronchitis more or less acute. Every source of bodily or mental excitement must therefore be strictly guarded against, while bleeding, counter-irritation, opiates, and antimony are employed according to circumstances. And whenever it seems, from the efforts of the patient or the sound of his respiration, that the air does not obtain a sufficiently free entrance, an opening into the trachea should be effected without delay.

Tracheotomy and Laryngotomy.

These titles are used to express operations, of which the object is to admit air into the lungs when the natural passage is obstructed, or to extract foreign bodies that have entered it. The diseases chiefly productive of obstruction are croup, *œdema glottidis*, and ulceration of the larynx. The membranous crust, which is effused in croup, and occasions the diminution of the air-passage, is generally of great extent, stretching from the larynx down the trachea into the bronchial tubes, and is so rarely limited within those bounds below which an aperture can be made, that an operation in this case must be regarded as only proper in almost desperate circumstances. *Œdema glottidis*, though not a very uncommon affection, is now so well known to the profession that any account of its symptoms or progress would here be equally unnecessary and out of place. It is sufficient to observe that, in this case, the obstruction is nearly or altogether confined to the *rima glottidis*, the lips of which are thickened by infiltration of serous effusion, so as greatly to impede inspiration, though they still al-

low of expiration being performed with moderate facility; and that consequently there is ample space below for making an opening to admit the air. M. Bayle's judicious observation, however, ought not to be forgotten, that if the operation is delayed until the disease has advanced so far as to occasion repeated threatenings of suffocation, it will hardly prove successful, owing to the excessive secretion of mucus which is induced by the continued irritation and dyspnœa. As soon, therefore, as the nature of the patient's complaint is distinctly ascertained, he ought to be impressed with the propriety and necessity of having the aperture made without loss of time. Ulceration of the larynx does not often impede respiration, though it deprives the patient of his voice, and occasions many other distressing symptoms. But sometimes the breathing in such cases suddenly becomes extremely difficult, and the danger of instant dissolution demands surgical interference, though there may not be the slightest prospect of permanent recovery, or of any advantage more than a few weeks, or even only days, longer existence.

The operation may be performed anywhere between the thyroid cartilage and sternum; but convenience and safety limit the choice more narrowly. The space between the thyroid and cricoid cartilages, though covered with little besides the integuments, and so far favorable for the purpose, is objectionable in general on the ground of its proximity to the disease, and always on account of the difficulty which has been experienced in obtaining here a sufficiently large aperture without encroaching on the cartilages of the larynx. In opening the trachea near the sternum, the depth of the tube, which retreats backward as it descends,—the presence of the thyroid veins in the line of incision, or even occasionally of the *thyroidea ima* artery,—and the transverse portion or isthmus of the thyroid gland, which often, especially in females and children, leaves hardly any accessible space below its inferior margin, are obstacles of no inconsiderable importance. The most convenient situation seems to be immediately below the cricoid cartilage. A sufficient portion of the trachea is here often left uncovered, and what more room is required may be gained by turning aside or dividing a little of the glandular substance. The bleeding from it should be allowed to cease before the trachea is opened.

In performing the operation, there are required a scalpel, a

couple of hooks, a sponge, and a tube of the flattened conical and slightly curved form, which has been found most convenient for the purpose, and of a size suited to the age of the patient. It is well also to be provided with forceps and ligatures, in case of meeting with any arteries unusually large or irregularly distributed. The patient should be seated on a chair, with his head bent back and rested on the breast of an assistant. An incision, about an inch and a half long, is made as nearly as possible in the mesial line. The space between the sterno-hyoid muscles is recognized by its white appearance, and opened with the knife. The operator then feels for the lower margin of the cricoid cartilage, or the trachea, and cuts down upon its rings, the surface of which having been exposed, serves as a guide for bringing into view what further space is required for the opening, which should be about half an inch long, and is readily effected by pushing in the knife, while an assistant holds aside the muscles with a hook in each hand. Before wounding the trachea it is proper to wait a little until the arterial bleeding has nearly ceased, or has been suppressed by ligature, should such means be required, which is seldom the case. But as the obstructed respiration, which renders the operation necessary, impedes the venous blood in returning to the heart, the surgeon should not delay opening the trachea on account of dark-colored bleeding. A violent access of coughing follows the introduction of the tube, which is useful in ejecting the accumulated mucus, and any blood that may have entered; but the patient soon becomes accustomed to the unusual irritation, and respiration is performed without any uneasiness. The viscid tenacious mucus, which is usually secreted very copiously in cases requiring the operation, is apt to obstruct the tube, whence the necessity of employing one at first of a larger size than would be sufficient merely to admit the air, and of clearing it from time to time by means of a probe wrapped round with lint. The tube must be retained in its place by means of tapes passed through rings at its mouth, and tied behind the neck. It should be taken out and washed daily, as long as there continues to be occasion for its use; and it will be prudent to cover the orifice with gauze, to prevent the entrance of injurious matters from without.

Foreign bodies are very seldom admitted through the *rima glottidis;* but as the accident, when it does occur, is attended with

very distressing and dangerous consequences, great care ought to be taken lest it be overlooked. When it is learned that the patient, while in his ordinary health, in performing the action of deglutition, or, if a child, in playing with some small foreign body in his mouth, was all at once seized with a violent cough, which has continued to recur in paroxysms with variable intervals, although no other symptom of local inflammation or constitutional disturbance can be perceived, the presumption will be strong that this accident has happened; and if the sensation of something moving in the trachea should also be felt, there can remain little room for doubting that a foreign substance has entered the air-passage. If it is of heavy material, as a piece of money, relief may be obtained by inverting the body. It has also occasionally happened that a violent cough proved the means of cure by ejecting the foreign body through the glottis, but no reliance can be placed on this rare chance; and the danger of suffocation, continued irritation, or suppuration of the lungs, fully warrants recourse to tracheotomy.

When the operation is performed with this view, it should be conducted in the same way that has been described, with the exception that, instead of a tube being introduced into the trachea, the edges of the opening are held asunder by a couple of hooks, until the source of irritation is expelled by the forcible stream of air which it occasions.

Should the bit of bone, pea, nut, or whatever may have entered, not appear at the orifice, a pair of curved forceps may be introduced upward to search the larynx, and, if necessary, the cricoid cartilage should be divided to afford more room for this purpose. The forceps may also be directed downward if there is reason to suspect that the foreign body is impacted in one of the bronchi, of which the right one, as being the larger, and more directly in the course of the trachea, will be more likely to contain it.

In cases of urgency, either from the presence of a foreign body, or sudden swelling of the parts concerned, though the proper apparatus for performing tracheotomy cannot be procured, the patient should not be permitted to die of suffocation. A penknife being thrust into the space between the thyroid and cricoid cartilages, as near as possible to the former, and carried down so as

to divide the latter, will afford a sufficient aperture, the edges of which may be kept apart by a thin bit of wood or the expanded branches of a small pair of forceps.

Removal of Foreign Bodies from the Pharynx and Œsophagus.

The detention of matters, in passing from the mouth toward the stomach, is owing either to their size or their figure. If prevented from descending on account of their bulk merely, they are generally arrested at the commencement of the œsophagus, just behind the cricoid cartilage,—since, this being the narrowest part of the tube, if not impacted more or less firmly into its orifice, they are expelled either upward or downward, by the contractile action of the pharynx,—and if fairly introduced into the canal, they have their descent favored by its increasing width. When, again, the foreign body is small and sharp-pointed, as a pin, needle, or fish-bone, it is usually entangled about the arches of the palate or the neighborhood of the epiglottis, often stretching across the cavity. And should it be impeded partly by figure, partly by bulk,—in other words, should it be small enough to pass readily into the œsophagus, if not prevented by its rigidity or angular form,—the bottom of the pharynx and commencement of the œsophagus are the situations where it is generally found.

In the case of a tough digestible mass impacted in the œsophagus, the usual method of affording relief is to push it down with a probang—*i.e.* a piece of whalebone with a sponge or ball of ivory fastened to its extremity. The patient's head should be held back, and the whalebone must be slightly curved to assist its taking the proper direction, which is further promoted by holding the larynx forward. Instead of this method, I prefer extracting the obstructing substance, which may in general be easily effected by means of long curved forceps. If the foreign body is of a hard substance, which might occasion inconvenience if swallowed, and more especially if it possesses an angular form, which might render its more firm lodgment the consequence of force being employed to push it down, the safest course is to induce vomiting, in order to effect ejectment upward. Where the passage was so completely obstructed as to prevent the swallowing of an emetic

for this purpose, a solution of tartrate of antimony has been injected into the veins; but such means are quite unnecessary, as irritation of the fauces by a feather or the point of the finger is sufficient to induce the most violent expulsive efforts, emptying the stomach of its contents, which carry out the foreign body along with them. In removing pins, needles, and such sort of things, the best plan is to ascertain their situation by means of the finger, and then extract them with the curved forceps. Patients frequently apply for assistance days or weeks after swallowing some pointed body, which they believe still remains fixed in the throat. If nothing can be felt with the fingers, it is most probable that the patient's feeling is deceptive, proceeding from imagination alone, or some irritation of the throat, and not dependent upon the actual presence of the foreign body, which may have descended or been ejected. And even should it be actually detained in the œsophagus, it would be safer to trust its removal to the ulcerative process, which will soon be excited by its pressure on the tissues concerned, than to persevere in fishing for it with any of the ingenious but ineffective contrivances that have been devised for the purpose.

Œsophagotomy.

The object of this operation is to make an opening into the œsophagus, or lower part of the pharynx, to extract a foreign body that cannot be removed otherwise; but such a circumstance happens so rarely that there are few instances of a surgeon being called upon in the whole course of his practice to perform the operation. Upon two occasions I have cut into the throat for the removal of a piece of bone which had passed through the coats of the œsophagus and caused deep-seated suppuration. In a third case I performed œsophagotomy for the extraction of a copper coin (Swedish penny), which had been impacted for more than two months in the œsophagus, opposite the upper bone of the sternum. All the patients were completely and permanently relieved.

The patient should be laid reclining, with the head bent backward and to the right side. An incision about two inches and a half in length is then to be made in the middle of the triangular

hollow at the upper part of the neck, which is bounded below by the sterno-mastoid and sterno-hyoid muscles. It should extend from the upper margin of the thyroid to a little below the cricoid cartilage. The *platysma myoides* and fascia of the neck having been successively divided, the sheath of the vessels will come into view, and the surgeon then making an assistant press the larynx to the right side, dissects inward to the pharynx, avoiding, if possible, the superior thyroid artery, and tying it if cut, until he feels the foreign body through the coats of the tube, or an ivory ball probang introduced by the mouth so as to distend them. He finally opens the œsophagus, and with his finger, or curved forceps, removes the body of which he is in search.

Stricture of the Œsophagus.

The œsophagus is subject to three different kinds of stricture: one depending on inordinate contraction of the muscular fibers; a second consisting in a simple constriction and thickening of the mucous membrane; and a third caused by degeneration of the coats of the tube, which, becoming the seat of a tumor, render the canal narrow and tortuous.

The first, or spasmodic stricture, is met with chiefly in young or middle-aged persons; particularly those of a nervous habit, or disposed to hysterical complaints, or who have suffered much from mental distress. It is recognized by the difficulty which is experienced in swallowing, and by a disagreeable sensation of constriction in the throat. The remedy consists in administering antispasmodic medicines, such as the tincture of valerian; correcting any irregularities that may be discovered in the performance of the various secretions; and, if necessary, passing a full-sized bougie into the œsophagus, which sometimes at once completely removes the unpleasant feelings of the patient. Similar symptoms are sometimes produced by an opposite or paralytic state of the muscles of deglutition; in which case, if the patient survives the derangement of the nervous system that primarily occasions this dysphagia, food must be supplied through a tube introduced from time to time into the œsophagus.

The second, or simple organic stricture, as it may be named, occurs chiefly at the commencement of the œsophagus, opposite

the cricoid cartilage; and for the most part in people of advanced age. The contracted part is usually of small extent, seeming as if it were caused by drawing a thread round the tube, and exists in various degrees of width, from that of a small quill upwards. The circumstances which occasion this morbid state have not been well ascertained. When irritating or escharotic fluids, such as the diluted mineral acids, or strong alkaline solutions, are introduced into the œsophagus, the usual consequence, in case the patient survives, is thickening and contraction of its coats. And it may reasonably be imagined that the change in question is produced by similar causes operating on a smaller scale; but the patient can hardly ever refer the origin of his complaint to any particular irritation from stimulating food or other source.

The symptoms of this disease generally manifest themselves very insidiously. The swallowing of large morsels becomes difficult and painful; the food is more carefully masticated than before; and as the contraction increases, while none but very small portions of solid matter can be got down, even they in passing the stricture occasion pain, which is felt shooting into the back of the neck and shoulders. From the frequent recurrence of this distressing sensation, and the dread of exciting it, the patient's countenance acquires a very characteristic expression of anxiety; which, together with the emaciation that results from deficient supply of nourishment, is almost sufficient to betray the nature of the case to an experienced practitioner. It may be added, that the voice is peculiar, sounding as if the person spoke with a foreign body in his throat; that there is no swelling to be perceived by external examination; and that, though there is frequent spitting of saliva, no blood is discharged. But the only method of positively ascertaining the existence, seat, and degree of stricture, is to introduce a succession of bougies, gradually decreased in size from that which ought to enter the œsophagus readily, if it were sound, down to that which the constriction is capable of admitting.

The treatment of this kind of stricture has been conducted on two principles: one of them being to apply caustic, with the view of destroying the thickened or contracted part of the membrane; and the other to produce a gradual dilatation of it by means of bougies. The former of these methods, though supported by

the strong recommendation of Sir E. Home and other authorities, labors under the objection of being painful, difficult, and attended with great danger of injury to the neighboring parts; while the latter is not only in a great measure free from these defects, but proves much more speedy in its operation. The bougies may be constructed either of elastic gum or of steel. If of the second kind, they ought to be a little curved, and have their extremity made slightly bulbous, as this enables the operator to feel more distinctly when it has passed the stricture. The effect of bougies in removing strictures of mucous canals is not, as was formerly supposed, merely mechanical. This no doubt is the first effect; but another very important one follows, which is the action of absorption, induced by the pressure of the instrument. The organizable matter effused into the coats of the gullet, causing their contraction and thickening, is thus gradually removed. But if the bougies be passed with undue force, or too frequently, or be retained too long, the effect, instead of being absorption, is apt to be effusion, the consequence of which is an aggravation of the disease. The bougies, therefore, should be immediately withdrawn after being passed through the stricture; and the operation ought not to be repeated until the irritation of the previous one has entirely subsided, which usually requires an interval of two or three days. Great care must be taken to avoid making a false passage for the instrument, which, if improperly directed, or urged with undue force, may be readily pushed into the posterior mediastinum, or elsewhere through the coats of the canal. In this case the action of deglutition tends to propel foreign matters into the new aperture, instead of the strictured œsophagus, and speedy death is the almost inevitable consequence.

The third kind of stricture, or that which depends on morbid degeneration of the œsophagus, causing a tumor in its coats, and which may be named the malignant or carcinomatous stricture, is met with chiefly in persons beyond the middle period of life. It usually occurs at the ordinary situation of other strictures, that is, behind the cricoid cartilage; but sometimes takes place lower down, near the cardiac extremity of the tube. The symptoms are those of simple stricture, together with those attendant on morbid formations of the kind in question. The patient feels lancinating pain, more or less constant and severe, in the

part affected. A tumor can often be perceived by external examination of the throat. There is occasionally a bloody, foul discharge; and the patient's countenance acquires that greenish-yellow complexion which characterizes a system laboring under malignant disease. As it is evidently impossible to effect excision of the tumor, the disease must be regarded as truly incurable; and any attempts with caustic, or the simple bougie, instituted either from misapprehension of the nature of the case, or an ill-grounded expectation of promoting absorption of the morbid structure, must prove injurious, by increasing the patient's sufferings and hastening the progress of the disease. This kind of stricture, as well as the one depending on simple contraction, is simulated by malignant disease of the stomach, which therefore requires to be carefully discriminated. This is best done by passing a moderate-sized bougie.

Bronchocele.

By Bronchocele is understood a tumor depending on enlargement of the thyroid gland. The morbid growth is usually most akin to the simple sarcoma; but sometimes consists, partly or entirely, of cysts, and has also been found to present cerebriform characters. The swelling varies in size, from the slightest perceptible degree of fullness to a magnitude that occupies nearly the whole space between the chin and sternum; and extends forward as well as laterally in large round irregular projections. Its consistence is soft and elastic, and a section of it exhibits a yellowish granular structure. The vessels are generally very much enlarged, in proportion to the size of the tumor, whence incisions into its substance during life are attended with profuse hemorrhage. Sometimes the whole gland is equally enlarged, but it generally exceeds on one side; and occasionally the swelling is entirely limited to the right or left lobe—particularly the latter. In this case the surgeon must be upon his guard against supposing that the disease is an aneurism of the carotid artery, or an independent tumor admitting of excision, which opinion he may be led to adopt by the seeming mobility of the growth, owing to the flexibility of its substance. Bronchocele is observed to abound chiefly in certain districts, which are mostly of a mountainous

kind, where it may be associated with mental imbecility. The frequency of bronchocele in such regions has not yet been satisfactorily explained. It has been attributed to the use of snow-water, the violent exertions required by the inhabitants in climbing precipitous paths, which, it has been alleged, must expose them to frequent venous congestion, and to the prevalence of a damp atmosphere in the misty valleys and ravines, which has been supposed likely to promote the growth of glandular swellings. In the countries where the disease is not endemic, it is almost entirely confined to females, generally commencing in youth or before middle age, and affecting chiefly the laboring classes.

The symptoms of bronchocele are swelling in the situation of the thyroid gland, which follows the motions of the larnyx during deglutition, and cannot be moved without a corresponding displacement of it. There is seldom much obstruction either of breathing or swallowing, owing to the resistance which is made by the cartilaginous structure of the air-passages, and the protection from pressure which the trachea affords to the œsophagus. Headache, however, not unfrequently results from the obstruction which the blood meets with in returning from the head through the jugular veins; and the patient occasionally complains of more or less uneasiness in the tumor itself. But, for the most part, the principal inconvenience sustained depends simply upon the bulk and weight of the enlargement; and after attaining a certain size, it usually ceases to increase.

The deep situation, muscular coverings, firm connections, and large blood-vessels of bronchocele forbid excision; and the attempts which have been made with this view afford a sufficient warning against their repetition, by the fatal issue that has almost invariably, and often immediately, followed them. The ligature of the superior thyroid arteries, which, though previously proposed by others, was first executed by Sir W. Blizard, does not seem deserving of adoption. The operation has been sometimes found extremely difficult, owing to the displacement and overlapping of the vessels by the tumor—it has even proved fatal, by giving rise to extensive ulceration—it has rarely or never affected an entire removal of the swelling—and has generally induced only a very partial absorption. The plan of passing a seton through the

tumor, in order to excite suppuration and a consequent diminution of bulk, which was brought into notice by Quadri of Naples (1818), but had been proposed and even practiced previously, is easily executed, and seldom leads to any serious bad consequences. Fatal cases, however, have been observed by Chelius and others, in consequence of the center of the tumor entering into a profuse suppuration, while the rigidity of the parietes prevented their contraction, so as to diminish the size of the cavity; and the good effects of the practice have been at best but of partial extent. Except, therefore, in cases where circumstances render it very desirable to reduce the size of the swelling, there seems to be little encouragement to employ the seton. If it is thought proper to do so, a skein of silk or cotton should be conveyed through the anterior part of the tumor where there is no danger of wounding the large arteries; compresses if necessary are then to be applied over the orifices, and fomentations with poultices must be employed afterward, if required by the occurrence of inflammatory consequences. When suppuration commences, the seton may be changed, and when the tumor ceases to diminish, it may be withdrawn altogether. Incisions into the tumor, and the application of caustic to it, which act on the same principle as the seton, are less eligible means, inasmuch as they are more severe in their administration and not so efficient. Mr. Liston employed the ligature with success, previously dissecting the integuments of the projecting part of the tumor, and then transfixing its base; and I once adopted this method in the case of a lady who had a lobe of the thyroid enlarged into a round tumor with such a narrow neck as to appear altogether insulated.

With the exception of those cases where some energetic interference is peremptorily required, which are fortunately rare, the best treatment for bronchocele is to blister the surface, and apply ointments containing iodine alone, or in combination with mercury. Ever since Dr. Coindet of Geneva introduced the use of this medicine to promote absorption (1820), it has been very generally employed both internally and externally for this purpose, while the internal use of burnt sponge, which was formerly considered the grand specific for bronchocele, has gone into disuse since iodine came to be regarded as its active principle in exciting the action of the absorbents. But for my own part I regard the

blisters as productive of nearly if not all the benefit; and therefore use them without any other means or treatment. When the case ceases to improve, or is obstinate from the commencement, the patient should be dissuaded from subjecting himself to any more severe expedients unless his existence should be threatened or rendered seriously uncomfortable by the presence of the swelling. The headache, which occasionally proves a distressing attendant of the disease, is sometimes much alleviated by the application of a few leeches to the temples from time to time.

When the enlargement is found to depend on the presence of a cyst, it should be punctured and injected with tincture of iodine, as in the case of hydrocele.

CHAPTER XVI.

THORAX.

Wounds of the Thorax.

SUPERFICIAL wounds of the thorax which do not penetrate the cavity require merely ordinary treatment. Muscular bruises occur very frequently, and often occasion so much uneasiness in respiration as to simulate inflammation, and induce the practitioner to employ copious and repeated depletion, which can do no good, and may prove very hurtful by inducing the symptoms of excessive reaction. The state of the pulse in such cases, if attended to, will prevent this injudicious practice, instead of which the injured muscles should be restrained from motion by encircling the chest with a broad bandage.

Penetrating wounds are attended with various important effects, the mode of production and treatment of which should be familiar to the practitioner, who on such occasions is called upon to act without delay on the knowledge he happens to possess.

If air be admitted through the aperture, as it must almost

necessarily be to a more or less extent, the lung of the side affected, unless adherent to the parietes of the cavity, contracts itself, owing to the elasticity of the pulmonary tissue, which is thus placed in equilibrio as to the pressure of the atmosphere. If only a small quantity of air has been allowed to enter before the wound is closed, the contraction of the lung will be proportionally inconsiderable. But if the wound remains open until the contractile tendency of the lung exerts its full effect, respiration, so far as that half of the pulmonary apparatus is concerned, will be completely suspended. The patient then feels great oppression in the chest; his cheeks become purple, owing to the imperfect oxygenation of the blood; his extremities are cold; his pulse frequent, small, and irregular; and if proper measures are not employed for his relief, death may ensue from congestion of the sound lung, or from the inflammation which results from this state. In cases of recovery the wound of the thoracic parietes heals, and then the air which had been admitted into the cavity of the pleura is absorbed, so that the lung is forced to expand, and performs its function as before the injury.

In conducting the treatment of a simple penetrating wound, it should be recollected that the danger consequent upon the injury proceeds from inflammation of the pleura, caused by the wound, or by oppression of the sound lung. The practice thus suggested consists in protecting the patient from all sources of bodily and mental agitation, and diminishing the quantity of blood in the system so as to lighten the labor of the weakened organ. With these views, the thorax should be surrounded with a broad bandage,—the horizontal posture, and strict antiphlogistic regimen, should be enjoined,—and blood should be taken from the arm in quantity proportioned to the strength of the patient, but so largely as to relieve, if not remove altogether, the sense of oppression which is felt about the breast, after which antimonials and opiates must be diligently employed to moderate the force of the circulation, supersede the necessity of further depletion, and lessen the risk of excessive reaction from what has been already employed.

When a wound of the thorax not only penetrates the cavity, but also extends into the substance of the lung, the consequences are still more important, since, in addition to those that occur in

the former case, there are the dangers which attend hemorrhage into the cavity of the pleura and into the bronchial tubes of the sound lung. The injury is generally recognized by bloody expectoration, and a discharge of blood or bloody froth from the wound. But it must be recollected that, though neither of these indications be observable, a wound of the lung may exist, and even be productive of a copious bleeding into the cavity of the chest.

The same objects of treatment exist here as in the case of a simple penetrating wound, but should lead to a practice still more decided and careful, as the danger must always be regarded as more serious. The circumstance of internal hemorrhage demands additional consideration, and has afforded fruitful subject of discussion in respect to the mode of preventing and remedying it, and also as to the diagnostic marks of its presence. Some recommend the external wound to be closed immediately, in order to retain the blood, and limit the extent of its effusion by effecting pressure on the breach of the lung. It is true that the fluid thus accumulated may be removed by subsequent absorption, without causing any trouble to the patient; but experience has ascertained that, instead of this salutary process, the irritation of its presence is more apt to excite a fatal inflammation, and there seems little inducement to incur this risk when the alleged advantage of the practice is fairly weighed. When the lung is wounded it must suffer a complete contraction, since the air, though not allowed to enter by the external wound in sufficient quantity to occupy the space required for its entire collapse, will find a ready entrance from the branches of the trachea which are wounded; and the external surface of the lung being thus maintained permanently in equilibrio with the internal one as to the pressure of the atmosphere, the elasticity of the organ will meet with no obstacle to the exercise of its contractile tendency. The cavity for the reception of the blood must therefore be very capacious; and when the yielding nature of its parietes toward the diaphragm and the other side of the chest is taken into account, it seems difficult to conceive the possibility of making effectual pressure on the cut surface of the lung by retaining the fluid.

For these reasons it appears to be the more prudent practice to afford free exit to the blood by keeping the original wound open, or making a new one in a more convenient situation, while

by bleeding from the arm, and the other means that promote the cessation of hemorrhage by inducing coagulation in the wounded vessels, the further flow of blood from the lung is restrained.

If the wound of the parietes is small, or near the upper part of the chest, internal hemorrhage may take place to a great extent without any external indication of its existence, especially if, as sometimes, but very rarely, happens, it should proceed from one of the intercostal arteries. Various symptoms of blood accumulating in the chest have been observed and carefully described as affording the means of recognizing it. Of these the most important are, coldness of the extremities—clammy perspiration of the face—a purple color of the cheek on the side affected—inability of lying on the sound side of the body, which is probably the cause of the preceding symptom—extreme oppression of breathing—a small fluttering pulse—suppression of urine—and a want of the usual resonance when the affected side of the chest is subjected to percussion. As all these signs, and also those more questionable ones which have not been thought deserving of mention, whether taken together or separately, must be regarded as insufficient to yield positive proof on the subject, it is prudent in doubtful cases to open the wound in order to ascertain the truth.

In consequence of wounds and fractures of the thorax, air is frequently injected into the cellular substance under the integuments of the chest, constituting what is called Emphysema, and in other cases it is accumulated within the pleura so as to distend the membrane, and compress the sound lung with distressing or even fatal effect. It is highly important to be acquainted with the circumstances on which these events depend, and the mode of preventing or remedying them.

For the production of emphysema, it is requisite that there should be an aperture in the *pleura costalis*, to admit the air into the cellular substance, and the power which forces it to enter is always the contraction of the parietes of the thorax; but there are two sources from which the air thus impelled may be derived. One of these is a simple penetrating wound of the thoracic parietes, so narrow, or so shaped and situated, as to allow the air to enter the chest during inspiration, but oppose its free exit during expiration, permitting it to pass no further than through the

pleura. The second is a wound of the lungs and *pleura costalis*, existing without any outlet through the parietes of the chest, which may be caused by the spicular extremity of a fractured rib, or may result from the healing of the skin while the breach in the lung and pleura remains open, in a case where both the parietes and lung have been wounded. When the air enters the cellular substance it diffuses itself more or less extensively, and occasions a flat undefined swelling of the integuments, which is recognized by a crepitating or crackling sensation, that is felt on pressing it, and by the quick disappearance of dimples thus occasioned in its surface. The integuments of the whole body, except where the subjacent connections of the skin are very firm, as the palms of the hands and soles of the feet, may be distended in this way; but universal emphysema is an extremely rare occurrence, its extent being usually limited to the side of the chest which has been injured. The treatment is simple and obvious, consisting in the application of a compress over the wounded part, to oppose the further issue of air from the cavity of the pleura, and, if necessary, in making punctures at different places, to discharge that which is contained in the cellular substance; but this should not be done unless the swelling is so great as to be productive of much inconvenience, since, if left to itself, it will soon be removed by absorption.

Accumulation and confinement of air in the cavity of the pleura, or *pneumothorax*, as it is called, though less obvious to sight than emphysema, is a more distressing and dangerous occurrence. It gradually distends the membrane in which it is inclosed—presses upon the pericardium and sound lung—and may at length occupy so much of the thoracic cavity as not to leave sufficient space for the lung of the sound side to perform its function. In this case, as has been already remarked, the air may either enter by an external wound, which is of such a valvular kind as to allow of its getting in when the chest is expanded during inspiration, but prevents its exit when the parietes of the cavity are drawn together during expiration; or may pass into the pleura by a wound of the lung which exists without an external one—the wound of the lung itself having necessarily a valvular effect, as the soft substance of the pulmonary tissue, though opposing no resistance to the escape of air from the small bronchial tubes, will prevent its return into

them by collapsing round their cut orifices, when subjected to pressure during expiration. In either of these circumstances, every inspiration will tend to enlarge the quantity of air contained in the pleura, while the succeeding expiration has little or no effect in reducing it. The patient consequently feels great and increasing difficulty of breathing. The inspirations are short, almost instantaneous, and effected with a sort of catch. The expirations are laborious and ineffectual; and there is a distressing sensation of tightness across the breast; the pulse is small and irregular; the countenance is livid; and unless relief be afforded, death ensues. The symptoms of this condition bear considerable resemblance to those of hemorrhage into the pleura—but the resonance of the chest, which is absent in the latter case, and more than usually distinct in pneumothorax, distinguishes the one from the other.

If emphysema is present along with pneumothorax, scarifications should be made for the discharge of the air contained in the cellular substance, which also afford exit to that accumulated in the chest; but if this proves insufficient, or if there is not any emphysema, an opening should be made without delay through the parietes of the thorax. *Paracentesis thoracis*, for this purpose, was first proposed by Mr. Hewson.

Paracentesis Thoracis.

Paracentesis, or puncture of the thorax, is performed to evacuate air, blood, pus, or serum, accumulated to an injurious extent within the cavity of the pleura. It might appear at first sight that almost any part of the parietes could be chosen for this purpose, but the following considerations limit the proper bounds of the operation to a more narrow space. An opening higher up than the fifth or sixth rib would not afford a convenient outlet for the fluid which requires to be discharged—and it could not be made lower than the ninth or tenth without incurring the danger of injuring the diaphragm. The intercostal spaces not thus interdicted are thickly covered with muscles for a third part of their extent at least, from both the sternal and vertebral extremities; and at these parts the intercostal arteries are more exposed to danger than in that which lies between the angles and the carti-

lages of the ribs. The principal vessel of each intercostal space runs along the lower edge of the superior rib, overlapped and protected by the sharp descending ridge of its external margin—but a branch of the artery proceeds along the upper border of the lower rib—and the safest place, consequently, for cutting through the parietes is equidistant between the two ribs that circumscribe the space selected for the operation. It appears, on the whole, therefore, that the best situation for operating is between the fifth and eighth ribs on the right side, and the sixth and ninth on the left, where the presence of the pericardium renders it prudent to cut lower, at an equal distance from the sternum and spine, and in the middle of the space between the two ribs.

The patient should be laid on a sofa, or brought to the edge of his bed, and be made to bend his body so as to render the affected side of the chest as convex as possible. The surgeon then introduces a small trocar, without any preliminary incision of the integuments, and withdraws the canula when the fluid has escaped.

Diseases of the Mamma.

The Mamma is liable to so many diseases that it is necessary to make a classification of them. They may be divided into—1. Those in which there is merely derangement of its nutritive or sensitive action, causing simple enlargement, induration, and pain; 2. Those in which there is a collection of purulent fluid; 3. Those in which there is a morbid growth limited to the part in which it originates; and, 4. Those in which the growth is of a malignant kind—that is, tends to spread, ulcerate, or fungate, and affect the patient's constitution.

The first of these divisions comprehends the painful indurations which occur at the time of puberty and in the early months of pregnancy—also a more chronic condition of the same kind, not unfrequently met with in middle-aged women—and lastly, a painful state which is named the Irritable Breast. The second division includes the Acute or Milk Abscess, as it is usually called, and the Chronic Abscess. The third division embraces Simple Sarcomatous, Fibrous, and Cystic Tumors; and the fourth, those of the Carcinomatous, and Medullary or Cerebriform kinds.

In both sexes about the time of puberty the breasts frequently

become enlarged, hard, and painful, but soon return to their ordinary condition, and seldom require any treatment further than the application of fomentations or some soothing lotion. This state of excitement, which attends the development of the sexual organs, is apt to occasion alarm, from being supposed to denote malignant action of the part, and, there is reason to fear, has even led to excision of the gland. The same observations will apply to the painful and slightly swollen state of the breast which is observed at the commencement of pregnancy.

Induration of the breast at a more advanced age is a very common effect either of slight direct irritations, as blows or bruises, or of the indirect irritation which proceeds from suppression or derangement of the natural secretions. Women about the middle period of life, particularly those who are not married, or who have no children, are most liable to this complaint. It generally affects both breasts, but is sometimes limited to a lobe of one. The induration is not well defined. It does not feel very hard or heavy, and, if attended with pain, the patient describes her uneasiness as a sort of burning sensation, which is not always equally severe, but varies much in this respect, according to the state of mind and body. The patient's appearance and time of life, the history of the tumor, its consistence, and the readiness with which it generally yields to proper treatment, distinguish this from more serious affections of the mamma. When the breast is particularly painful, leeches and warm fomentations may be used with advantage, or a litharge plaster may be applied over it; but local treatment is to be regarded as of secondary importance, since the disease almost always depends upon the state of the general health, and is to be remedied by its improvement. With this view, any derangement of the intestinal or menstrual secretions which is ascertained to exist, must be, if possible, rectified without delay; and then a gentle course of alterative medicine, especially the saline laxatives, used daily, with due attention to the mental condition of the patient, ought to be carefully employed.

The mamma sometimes becomes the seat of uneasy sensations so distressing and unceasing as fully to warrant the appropriation of a particular title to express them. The Irritable breast is generally met with in middle-aged women, of nervous disposition, who have been much exposed to grief, disappointment, or anxiety.

It is recognized by the extreme suffering of the patient, who represents the pain as equally intolerable and indescribable. It never leaves her entirely, but has remissions of partial relief, and exacerbations in which the agony is extreme. These paroxysms are induced by everything that directly or indirectly occasions excitement. Pressure, as that applied in examining the breast, agitation of mind, and derangement of the secretions, are the most certain means of producing this effect. When the patient submits to an examination of the painful part, it is felt to be a little fuller and denser than usual; sometimes engaging the whole gland, and at others being confined to a single lobe, or a still smaller portion. In cases where the symptoms are mild, great or even complete relief is sometimes obtained from fomentations and other soothing local applications, together with the internal medicines requisite for restoring to a healthy state the secretions that may be deranged. If these means prove unavailing, and the patient suffers such distress that she insists upon the seat of the pain being removed, this wish must sometimes be complied with in order to allay the apprehension of malignant disease, which greatly aggravates the complaint by agitating the mind. The gland, when cut into, displays a somewhat whiter and denser structure than usual, and frequently also cysts of various size containing a limpid fluid. The operation is usually followed by an interval of complete relief, and sometimes by a permanent cure; but the cicatrix or neighboring parts are apt to become the seat of sensations similar to, though seldom so severe as, those previously experienced, and for which the same soothing means ought to be employed.

The milk abscess is a collection of purulent matter formed in the mamma during lactation. If, while the gland is in this active state, constitutional disturbance should be excited by exposure to cold, errors of diet, or any other circumstances, the fever thus induced is very apt to be attended with or followed by inflammation of the previously excited organ. The patient's first intimation of indisposition is a rigor, accompanied with pain of the back, and headache, which is soon succeeded by heat of skin, quickness of pulse, loading of the tongue, and flushing of the face. At the same time the breast becomes red, tense, and painful, while the short but smart fever, or Weed, as it is vulgarly

named, subsides in the course of twenty-four or forty-eight hours. In a few days, if the inflammation does not terminate in resolution, the fluctuation of fluid may be felt in the mamma; and if the process is allowed to proceed naturally, the matter is evacuated by ulceration or sloughing of the integuments.

In treating this affection it is usual to begin with the application of leeches; but it does not appear that much advantage is thus obtained. Warm fomentations externally, and saline purgatives, to promote the intestinal secretions, with gentle antimonial draughts to produce a similar effect on the skin, ought to be employed in the first instance, as being the most efficient means for inducing resolution of the inflammatory action. If it goes on to suppuration, poultices should be substituted for the fomentations, and the patient must observe a restricted regimen to moderate the flow of blood toward the breast. The cavity of the abscess generally heals sooner when evacuation of the matter is not hastened by using the knife, before the suppuration is so far completed that the thin superjacent integuments project or *point*. When the process is thus far advanced, a free incision should be made, since it will not then delay the subsequent process of cure, but accelerate it by preventing extensive ulceration, sloughing, or the formation of sinuses. After the matter has been discharged, a poultice is useful for a few days; and then simple dressing, succeeded by some gentle stimulating lotion, may be used to dress the sore until it is completely healed.

The chronic abscess forms insidiously without any observable symptoms of inflammation. It occurs at all periods of life, but is met with most frequently in middle-aged women. The size of the swelling is generally about that of an egg, its contents are usually thin, and it is for the most part deeply seated. The integuments being free from redness and tension, while the substance of the gland, except in the neighborhood of the part affected, where it is condensed and thickened, retains its natural consistence, the abscess is apt to be mistaken for a solid tumor; and this error is in some cases confirmed by swelling of the axillary glands, which, taking place in consequence of the irritation caused by the collection of fluid in the mamma, or perhaps altogether independently of it, is regarded as evidence of malignant action propagated along the absorbents. The equality of the surface of the tumor

when examined through the parts lying over it, the absence of pain when this is done, and the feeling of fluctuation that may then be more or less distinctly perceived, afford in general sufficient grounds for an accurate diagnosis; and should there remain any doubt as to the nature of the swelling, it may be readily resolved by making a puncture, which will evacuate the fluid if there is any, and will do no harm if there is not, since in that case excision ought to be performed without delay. A free opening should be afforded to the matter, and the sides of the incision must be carefully kept separate to prevent their union, which is very apt to happen owing to the thickness of the parts. This operation is sometimes followed by considerable inflammation and constitutional disturbance, during the continuance of which, fomentations, with poultices and suitable remedies of a general kind, are to be employed according to circumstances. If necessary, more free dilatation, and stimulating washes, with an alterative course of medicine and diet to improve the patient's health, may afterward be had recourse to.

As a consequence both of this and the former kind of abscess having been improperly treated, there frequently remain sinuses of great extent, seated very deep between the mamma and pectoral muscle, and running through the substance of the gland in various directions. A copious thin sero-purulent discharge issues from the orifices, which are generally numerous, and the whole breast becomes hard, and immovably attached through induration and adhesion of the muscular, cellular, glandular, and cutaneous tissues. The appearances presented by the disease are then so alarming, to one not acquainted with the nature of the case, that excision of the affected parts might very readily be thought of, and, there is reason to believe, has even been executed. Mr. Hey of Leeds proposed, as a substitute for removal, the free incision of all the sinuses, so as to lay them fairly open, however numerous and deep, even though it should be necessary in doing this to divide, or even insulate, portions of the gland. This severe practice is not necessary, since experience has shown, that merely enlarging moderately with the knife the orifices of the more dependent sinuses is sufficient for the purpose.

Simple Sarcoma.

Simple sarcoma, or hypertrophy of the mamma, seldom occurs to such an extent as to constitute what may be regarded as a disease, since enlargement of the breast is generally owing much more to redundance of the adipose tissue than the size of the gland. Occasionally, however, the mamma does suffer a morbid increase, and may attain such dimensions as to become an insufferable load to the patient. Cases are recorded in which tumors of this kind were found after removal to weigh many pounds; and if the tumor continues to enlarge, or is the cause of intolerable oppression to the patient, there can be no doubt as to the propriety of removing it.

Fibrous Sarcoma.

This tumor is not, like the one last mentioned, merely an enlargement of the mammary substance, but a distinct new formation. It possesses a fibrous structure of variable density, from that of fiber cartilage to the consistence of a salivary gland; its color is generally white, or grayish-yellow; its figure is usually round, or oval, with an irregularly-nodulated surface of a glistening appearance. When small, it is extremely movable, and seems, upon examination through the integuments, as if it could be pushed about from one part of the breast to another. As it enlarges, the gland, being subjected to pressure, suffers a progressive diminution of size, until at length so little trace of it may be left as even to require a search for its discovery. This kind of tumor is generally met with in unmarried women between the ages of twenty and forty. It grows with very different degrees of rapidity, sometimes remaining for years no larger than a walnut, and at others in the same period attaining such a size as to weigh several pounds. There is seldom much pain referred to the breast affected, and when it is complained of, the mental uneasiness, excited by apprehension of cancer, is probably the principal cause of its production. If the tumor is small, it may be cut out to relieve the patient's anxiety; and if so large as to occasion inconvenience, its extirpation is more decidedly proper.

In the former case, it is necessary to make merely a simple incision through the integuments and substance of the mamma, so as to lay open freely the capsule of condensed cellular membrane which surrounds the tumor and loosely adheres to it; but in the latter, where the morbid growth, from its long standing and large size, may have induced more or less absorption of the gland and adhesion of it to the adventitious structure, it is best to remove the whole together. In cutting tumors *out* of the mamma a troublesome hemorrhage may be expected, from the numerous arterial branches which are divided; and, in addition to a number of ligatures, it is sometimes necessary to stuff the cavity with lint.

Cystic Sarcoma.

It is comparatively rare to meet with tumors in the mamma entirely composed of a cystic structure; but cysts are frequently found in growths of a solid kind, particularly the one last mentioned, and are sometimes so large and numerous as to constitute the principal feature of the disease. Such cystic formations occur at all periods of life, generally in women of a healthy appearance; occasion little inconvenience, except from their size; and tend to increase without any limitation. Their nature may sometimes be recognized previous to removal by the imperfect feeling of fluctuation and bluish appearance of their contents, perceived through the thin distended integuments by which they are covered; but, in general, the nature of the structure is not precisely ascertained until it is displayed by a section. The inconvenience which results from the bulk of the tumor, and the risk of its becoming the seat of malignant action, are sufficient grounds for recommending the excision of the disease at all stages of its progress; and the operation may be performed with the same favorable prognosis as for the fibrous and simple sarcoma. Simple serous cysts, existing without any complication of morbid texture, may be easily remedied by evacuating their contents through means of a trocar, and immediately afterward applying a blister.

Carcinomatous Sarcoma.

There is no other part of the body in which carcinomatous degeneration occurs so frequently as in the mamma, though a large proportion of the cases in which it has been, and still is, too often supposed to exist, if subjected to a more accurate diagnosis, would be referred to other kinds of disease, and particularly to those that have been already considered. Carcinoma occurs in the breast at all periods of life, from the age of twenty upwards; but commences rarely before thirty-five, and most frequently between forty and fifty. It sometimes seems to be called into existence by the irritation of a blow or bruise, and is occasionally preceded by simple induration of the gland; but very often a local cause cannot be assigned, or is so loosely connected with the appearance of the disease as to give no good ground for believing in its operation. The suppression of the menstrual secretion is regarded as a great predisposing, or even exciting, cause of the morbid action, by disturbing the balance of the system; and it has been observed that distress of mind, errors of diet, and any other circumstances which derange the secretions, tend further to promote the commencement and increase the activity of the disease. I am inclined to think that the cessation of the menstrual discharge does not exert so much influence as is generally attributed to it, and suspect that this opinion rests more upon theoretical grounds, or views of probability, than actual experience. It is true that, in women suffering from cancer of the breast, the catamenia are seldom present; but if inquiry be made whether their disappearance or the commencement of the disease was first noticed, the latter will in many cases prove to have been the earlier of the two events.

Carcinoma of the mamma is recognized by its inequality of surface, extreme hardness, and specific gravity, which is greater than that of any other tissue, sound or morbid, except bone and cartilage. The integuments, when adherent to the tumor, are puckered, and drawn toward it. The nipple is flattened, hardened, and depressed. The patient complains of occasional lancinating pain shooting through the tumor, and from it in various directions; and she generally betrays, by her greenish-

yellow complexion, that depraved state of health which, whether it be a cause or consequence, or partly both, as is most probable, usually attends such local affections. The course of the morbid process, if it be allowed to proceed, is to engage the glands of the axilla, which become enlarged and indurated; to form ill-conditioned matter in the substance of the carcinomatous masses; to evacuate the contents of these abscesses by ulcerative absorption of the superjacent parts; and thus give rise to sores which prove truly incurable cancers. The pain and discharge that ensue occasion more or less exhaustion of the patient, but are seldom the immediate cause of death, as she generally dies before they produce this effect; and existence is often terminated in such cases so suddenly and unexpectedly as to suggest the suspicion of a poisonous influence proceeding from the disease. The patient generally complains of what she believes to be rheumatic pains extending through the whole body, but being particularly severe in the affected side, which is often œdematous, numb, and powerless; and the fatal event is usually preceded by sickness, loss of appetite, and extreme weakness. Effusion into the cavities of the chest is occasionally the cause of death. The skin sometimes shows a great tendency to assume the diseased action, either being primarily affected with it, or, while the gland is undergoing this morbid change, becoming studded at various distances with flat carcinomatous tubercles. The disease varies greatly in the rapidity of its progress, according to circumstances, which seldom admit of being satisfactorily distinguished, but generally proceeds more slowly in advanced periods of life.

The appearances which are presented by the section of carcinomatous tumors, though they all agree in some respects, differ considerably in others. There is always more or less of a very dense, almost cartilaginous structure, of a mixed brownish-gray and bluish-white color, which exists either in the form of compact masses, with bands of a similar structure, that radiate from the center,—or in that of capsules, smooth and distinct externally, but gradually softening toward the interior. Within this texture there are, as the disease advances, cavities filled with a soft friable grayish-yellow or brown substance, or thin imperfectly-formed purulent matter. Sometimes the appearance produced by the radiating fibrous bands is strikingly marked, while at others,

though the carcinomatous texture does not form a capsule, the confines of the morbid formation are very distinctly circumscribed,—and there seems to be a mixture of the brown and white dense texture approaching to a granular consistence, and containing small cells filled with semifluid matter. The distinction between this and the more diffused form of carcinoma should be carefully observed, as it affords some assistance in deciding on the prognosis as to the duration of recovery after the tumor has been removed. When the lymphatic glands suffer carcinomatous degeneration, the morbid structure always assumes the capsular form, unless the disease should be very far advanced and adhesions to the neighboring parts have taken place. In this case radiating bands may be discovered, but hardly with the same distinctness that they usually present themselves when the disease originates in the substance of the mamma.

The cure of carcinoma, whether in the state of scirrhus or cancer, by external or internal remedies, being confessedly impracticable, it does not seem necessary to mention the various means that have been ineffectually employed for this purpose. Leeching, soothing fomentations, and attention to the general health, alleviate the uneasy sensation of scirrhus, and delay its progress toward ulceration. Poultices of hemlock, and Fowler's solution of arsenic, diminish the agonizing pain of cancer. Solutions of chloride of lime or soda destroy the fetor which proceeds from its discharge; and more or less temporary amendment results from the application of various ointments, powders, and washes, which can never be prescribed with any certainty of benefit, and must be frequently changed to obtain even the slight and transitory improvement that they at best afford. The usual method of giving relief is to remove the morbid structure with the knife, the depth and connections of the affected parts rendering other means of extirpation, such as caustic and the ligature, seldom admissible. Few questions in surgery have occasioned more discussion than that which has been, and still is, agitated in regard to the propriety of operating. It is admitted that relapse frequently occurs after excision has been performed; but much difference of opinion exists as to the chance of its doing so, and the consequent advantage of the operation. It would appear, on the whole, that the prospect of permanent recovery is not so

hopeless as it has been represented, provided the operation be performed only in proper cases and in an efficient manner. Similar diseases are removed from other parts of the body, as the lip, with almost invariable success; but no surgeon thinks of cutting out a cancer of the lip if there be an affection of the glands under the chin; and, in operating, he carries his knife wide of the morbid part, and leaves a perfectly sound surface for healing. In excision of the mamma, on the contrary, a diseased state of the axillary glands is often either totally disregarded, or considered no obstacle to the operation, provided they admit of removal; and the surgeon frequently cuts close to, or perhaps at some points through, the substance of the tumor. It need not, therefore, excite any surprise, or lead to distrust in the advantage of the operation, to find that the disease frequently returns. The affection of the glands should be regarded as an objection to the operation not so much from presenting an obstacle in the way of its complete performance, as from affording evidence of a tendency in the constitution of the patient to take up the diseased action.

The different cases of carcinomatous disease may be divided into—1. Those where an operation is altogether improper; 2. Those where it may be performed, but with a very unfavorable prognosis; and, 3. Those where it has a chance of proving permanently successful. The first class will include cases in which there are enlarged glands so seated or connected that they cannot be removed,—or where the skin is so extensively diseased that all the morbid portion of it cannot be taken away,—or lastly, where there is positive evidence of some other part of the body, as the stomach or uterus, being similarly affected, or of some other internal disease of a serious nature, such as dropsical effusion of the chest. The second class comprehends those cases in which the glands are tainted, but within reach,—or in which the disease is in the state of open cancer, or the progress of the morbid process rapid,—or the patient's appearance unhealthy. And to the third class may be referred those in which the disease has advanced slowly,—feels circumscribed,—is not attended with enlargement of the glands, and exists in a person of tolerably healthy appearance. Should the complaint have been distinctly the consequence of local irritation, or the patient be of an age at which the predisposition is generally not very strong, as above

sixty, the prognosis will be still more favorable. In very advanced periods of life, as beyond seventy, the diseased action is so slow, and the chance of troublesome symptoms consequently so small, that the operation would in general not be warranted. In my own practice I decline to operate except in cases of the third class just mentioned, and have no hesitation in advising this limitation of interference with the knife, having seen much mischief and no benefit from operations where the glands were affected, though only in a slight degree.

When the operation is to be performed, the patient should be laid in a reclining posture, properly supported, and turned toward the light. The nipple, as being a part likely to take up the diseased action, if it has not already done so, and, for the same reason, the whole of the gland, should always be taken away. For this purpose two curved incisions are to be made in the direction of the fibers of the pectoral muscle, including an elliptical portion of the integuments, together with the nipple; unless the particular circumstances of the case render it more convenient to cut in some other way, so as to remove the whole of the affected integument. In calculating the direction and extent of the incisions, the object should be, in the first place, to include all the skin that is diseased; and in the second, to leave no more of it than what is sufficient for allowing the edges of the wound to be brought together without straining. The surgeon then exposes the anterior surface of the tumor completely, first separating the lower flap, and then the upper one, while the assistant presses his fingers on the orifices of the divided arteries. In doing this he should proceed carefully and deliberately, so as to cut wide of the confines of the disease, and keeping in mind that the permanency of recovery is a more important object than the rapidity of the operation. He lastly turns up the edge of the tumor and detaches its remaining connections. The vessels that continue to bleed having been tied, the edges of the wound should be stitched together and covered with compresses of lint. Instead of a bandage surrounding the chest, a folded towel ought then to be applied.

Medullary Sarcoma.

The medullary sarcomatous affection of the mamma occurs at all periods of life beyond puberty, but most frequently about middle age. The tumor is recognized by its usual characters of irregularly-nodulated surface and soft elastic consistence, either throughout its whole extent or at the most prominent parts, which are generally red, either of a dull or bright hue, and exhibit numerous small arborescent vessels. The pain attending the disease varies much in different cases, being at one time very severe, at another hardly perceptible. When there is a strong disposition to the unhealthy action, the complexion of the patient is of a greenish-yellow color, and the countenance has a peculiar anxious expression. The tendency of the morbid growth is to enlarge; to contract adhesions with the integuments and muscles in its neighborhood; to excite a similar disease in the axillary glands; to suppurate, ulcerate, and fungate; and occasionally in this last stage to throw out blood from time to time, but more frequently a thin watery discharge, which is in general very copious and fetid. The substance of the tumor often protrudes at the ulcerated openings in large masses, which seem nearly in a sloughing state, and are occasionally altogether detached. The bulk of the swelling is thus diminished, but enough of the disease remains to prevent a cure from being accomplished.

The different steps of this process are completed, and follow each other, with various degrees of rapidity. A few months are sometimes sufficient for the whole progress from the first to the last stage, and, on the other hand, years even may elapse before the disease proves fatal.

All external and internal remedies have been found quite unavailing in the treatment of medullary sarcoma, whether in the mamma or elsewhere, and the only mode of affording the patient relief is to cut out the morbid structure. To this operation the same objections have been urged as to that for carcinoma, and the same considerations ought to guide the surgeon in deciding on the propriety of its performance. If the whole of the diseased parts cannot be taken away, no operation ought to be attempted. If the operation be performed when the morbid

process has made a rapid advance—the patient's appearance is unhealthy—the confines of the tumor are indistinctly circumscribed—or when ulceration has taken place, the prognosis will be very unfavorable. If the tumor is of firm consistence—distinctly limited—not adherent—of slow formation—and the patient has a tolerably healthy appearance, the prospect of a durable recovery will be better. The appearances found on dissection also afford important indications in regard to the result. The more soft and bloody the consistence of the tumor is, the more malignant may be regarded the morbid disposition; and the more firm it is, the more fibrous intersecting bands it contains—the more, in short, it approaches the nature of fibrous sarcoma, the less fear may be entertained of a relapse.

Since the two kinds of malignant disease pass into each other by insensible degrees, and, when existing in their distinct forms, present varieties hardly less numerous than the cases in which they occur, any attempt to classify their shades of difference could obviously serve no purpose of practical utility.

CHAPTER XVII.

ABDOMEN.

Wounds of the Abdomen.

Wounds of the abdominal parietes not penetrating the peritoneum require merely the ordinary treatment that is proper for injuries of the class to which they belong. When the peritoneum is implicated, the wound must be regarded as much more dangerous, since this membrane, like all the others of a serous kind, is very apt to inflame when thus injured. There is seldom much internal hemorrhage in such cases, as the pressure of the viscera, which are contained in the cavity of the abdomen, opposes it.

In treating simple penetrating wounds, it is evidently proper, in the first place, to press back any part of the intestines or omentum that may be protruded through the aperture. This

should be done as gently and with as little delay as possible. Great care must be taken, also, that the protrusion is not merely returned under the integuments, without being fairly restored to the abdominal cavity, especially if the wound be oblique and narrow, as when inflicted by a pointed instrument. In cases of this sort, it has happened that the inner opening of the wound so compressed the intestines or omentum permitted to remain in it, under the erroneous impression that reduction had been completely effected, as to cause fatal inflammation. The surgeon, therefore, should follow the protruded parts with his finger, and not be satisfied with their replacement until he feels the point within the peritoneum, enlarging the wound in it, if necessary, by means of a probe-pointed bistoury. It is more particularly necessary to observe this precaution when any swelling remains at the seat of injury, or the protrusion tends to reappear after being pressed within the external orifice of the wound. I once successfully reduced a mass of omentum of the size of a walnut, that lay in an oblique wound, of which the inner aperture was not larger than a small quill. The edges of the wound ought then to be stitched together with the interrupted suture, and the patient must afterward be diligently protected from all sources of excitement. A milk diet and moderate depletion may be employed as preventives of inflammation; and should symptoms of it actually appear, leeching, together with warm fomentations of the abdomen, and the internal administration of calomel with opium, are to be employed without loss of time, since the safety of the patient will depend in a great measure on the activity and decision with which these means are used. During the first twenty-four hours, therefore, the surgeon should be constantly on the watch for increase in the frequency or hardness of the pulse, anxiety of the countenance, and tenderness of the abdomen to pressure. Should there be no positive evidence of the wound actually penetrating the peritoneum, as from protrusion of the viscera, it ought to be treated with the same attention as if there were,—since it is much better to run the risk of being too careful, than to fall into the opposite error of not being sufficiently so. And it would be highly improper to decide the question by probing, as, in case of the wound penetrating, this must necessarily increase the danger of inflammation.

When the intestine is wounded, the injury must be regarded as still more serious, and likely to be followed by the worst consequences. The reason of this will appear from the fact that, whenever the contents of the bowels are effused over the surface of the peritoneum, death is the invariable, and, in general, very speedy result. When this extravasation occurs in consequence of disease, the effect is the same, unless the ulcerative process, that forms the breach in the intestine, is preceded by or accompanied with such an effusion of lymph as to limit the extent of the mischief, and confine the extravasation within the bounds of an abscess. It is not easy to understand how the intestinal matters operate thus fatally on the system, when they escape into the cavity of the abdomen; for the patient often dies in a few hours after the discharge takes place, and long before it can be supposed that inflammation has proceeded to the extent requisite for destroying life. The symptoms presented are intense burning pain of the abdomen,—insatiable thirst,—coldness of the extremities,—collapse of the features,—cold, clammy sweat,—small, frequent pulse,—coffee-colored vomiting; in short, a condition nearly the same as that of sinking from mortification. The fatal event generally happens between the 20th and 30th hours, and seldom sooner than the 12th, or later than the 48th.

When death does not ensue until the later periods that have been mentioned, there are always traces of inflammation to be perceived; but when it happens within a few hours after the injury has been sustained, no such appearances can be discovered. The disastrous effect of penetrating wounds is opposed by the resistance which the surfaces of the neighboring viscera offer to the escape of the intestinal contents, and also by the contraction of the muscular fibers of the bowel at the injured part, which tends to protrude the mucous membrane through the aperture so as to obstruct it. If the effusion is restrained by these means for a short time, it may be prevented altogether by an adhesive exudation of lymph, that soon seals up the orifice and unites the adjoining surfaces together. It will be most apt to occur when the intestine injured is distended by fluid contents,—when the wound is longitudinal in respect to the direction of the canal,—and when, if transverse, it is so large as to divide the circumference of the gut to a considerable extent. Extravasation of the contents of

the urinary and gall-bladders produces the same effects as that of the intestinal matters.

Internal hemorrhage may occur either from an artery of the abdominal parietes, or from the vessels of the viscera. It is recognized by the usual indications of weakness, coldness, and sickness, together with a feeling of depression in the abdomen, and, in extreme cases, a fluctuation perceptible on examination externally. On dissection, the blood is found either diffused in a thin stratum over the whole peritoneal surface, or accumulated at one part.

In the diagnosis of wounded intestine, probing of every sort is quite inadmissible. The shape and size of the weapon that inflicted the injury, together with the direction and extent of the course which it seems likely to have taken, will afford some ground of probable suspicion; vomiting, or dejection of blood by stool, will not only prove that the gut has been wounded, but lead to a conjecture as to the seat of injury; and the symptoms of intestinal effusion, or the escape of feculent and bilious matters from the wound, will render the case more decided. Should the wounded intestine protrude through the integuments, the extent of the injury may, of course, be determined by simple inspection.

In respect to the treatment of wounded intestine, it is evident that unless the injured part presents itself to view, no local treatment can be employed to remedy the injury, and that the patient's only chance of recovery will depend upon the powers of the system effecting the process of reparation which has been described. The object of the surgeon should be to prevent this process from being disturbed, with which view he will be led to enjoin absolute rest, with strict starvation, and abstinence from purgatives. If the injured part of the gut is protruded, an important question will present itself in regard to the management of the wound, with respect to which much variety of opinion and practice has existed.

If the wound is very small, and especially if it is seated in a part of the canal not usually distended by its contents, the most prudent course will probably be to return the gut, as if it were sound, without any more ceremony. Should the wound be somewhat more than a mere puncture, and allow its cut edges to be distinguished, a suture ought to be passed through them by means of a needle, and tied, after which both ends may be cut away close

to the knot, and the gut returned, since it has been ascertained by experiments on the lower animals, that stitches inserted into the coats of the intestinal canal are detached by ulcerative absorption toward the interior of the tube, and thus escape with the feculent discharge. If the wound is so large as to require more than one stitch, as many as seem necessary are to be introduced in the same way, at the distance of a quarter of an inch, or less, from each other. If the wound is lacerated or contused, the injured part should be cut away before the edges are joined. And, finally, if the whole circumference of the gut is divided, it may be best to insert only one stitch on the side next the mesentery, so as to keep the two mouths of the intestine together, and then retain the aperture of the canal in correspondence with the external wound. A preternatural opening for the discharge of the bowel must thus in all probability be formed in the first instance; but the immediate danger will be diminished, while room is afforded for subsequent reparation in the way that will hereafter be described.

The viscera of the abdomen, with which may be included the urinary bladder in its distended state, are liable to be ruptured by external violence without the infliction of a penetrating wound. The symptoms are those indicative of extravasation of the intestinal matters; and the result is certainly fatal, almost always within the short period that has been already mentioned. It is important to know that the bladder, when much distended with urine, may be ruptured very readily, as by falling on the floor or the corner of a table,—since death occurring in such circumstances may give rise to very serious questions in medical jurisprudence. Urinary effusion from this source sometimes does not prove fatal before the lapse of several days, and in a case that came under my own observation the patient survived a week. It is also possible that the urine may be effused through a rent in the fore part of the bladder where it is not covered by the peritoneum, so as to escape into the cellular texture of the abdominal parietes and permit the patient's recovery, as happened in a case which I have placed upon record.*

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* Contributions to the Pathology and Practice of Surgery, p. 332.

Paracentesis Abdominis.

The abdomen is punctured for the removal of dropsical collections of serous fluid in the cavity of the peritoneum, and for the evacuation of cysts developed in the ovary, which grow so large as to occasion distention of the abdomen. The circumstances of these diseases, which denote the propriety of paracentesis, need not be considered here; and it will be sufficient to explain the mode of performing the operation.

The instruments employed for this purpose consist of a trocar and canula. The point of the trocar may be either in the form of a three-sided pyramid, or have a flattened heart-shaped figure with two cutting edges. The canula of the former is round, that of the latter flat; the first is generally employed, and ought to be preferred, especially in cases of ovarian dropsy, where the fluid is often very thick and viscid. In introducing the three-sided instrument, it was formerly the custom to make a preliminary incision through the integuments with a scalpel; but this is quite unnecessary, and the flat one may of course be still more readily pushed through the whole of the parietes at once.

Two situations have been chiefly selected for the operation—one in the *linea alba*, about an inch below the umbilicus; the other in the *linea semilunaris*, at a point between, and equidistant from, the umbilicus and superior anterior spinous process of the ilium. The former of these ought certainly to be preferred, since there is here no danger whatever of wounding either the vessels or viscera,—while, in endeavoring to puncture through the *linea semilunaris*, the surgeon runs a risk of injuring the epigastric artery, which, owing to the unequal resistance of the anterior and lateral portions of the abdominal parietes to the force of distention, alters its relation to these points. If it should ever be desired to puncture in this situation, the safest plan is to introduce the instrument at the distance of a hand's-breadth from the crest of the ilium, in the course of a line extending from the spinous process to the umbilicus.

The patient should be seated on a chair, or the edge of his bed, with the back and legs properly supported. A flannel bandage,

nine inches broad, and long enough to surround the abdomen, cross behind, and leave a sufficient hold for an assistant on each side, whose duty is to maintain the pressure as it is diminished by the evacuation of the fluid, is applied. The surgeon then having made an aperture in the bandage opposite the part where he wishes to puncture, and holding the handle of the trocar in the palm of his hand, while the point of his fore-finger is rested on the abdomen by the side of the canula, pushes the instrument through the thin distended parietes until he feels that the point does not encounter any more resistance. He then withdraws the trocar, and at the same time insinuates the canula a little farther, to prevent any chance of its escape during the flow of the fluid. When it appears that the cavity has been emptied, the canula may be taken out,—a piece of folded lint is placed on the wound, —the ends of the bandage, which hitherto have been held by the assistants, are brought round and fastened over the front, or opposite sides of the abdomen—and the patient is replaced in bed.

Hernia.

When the viscera of the abdomen are protruded through the parietes of their containing cavity, while the integuments covering the part remain entire, the displacement is named a Hernia. It was formerly thought that the peritoneum was necessarily torn in such cases, whence the disease was named Rupture; but it has been fully ascertained that, except in some few rare cases, this membrane always remains entire, and being pushed before the protruded viscera, constitutes a pouch or Sac, as it is called, for their reception. Hernia may take place at almost any part of the abdominal parietes, but does so most frequently through the apertures that naturally exist in them for the transmission of vessels. These are the inguinal and femoral canals, and the umbilicus; and the hernial protrusions which occupy them are accordingly named Inguinal, Femoral, and Umbilical.

Inguinal Hernia.

The vessels of the testicle in the male, and the round ligament in the female, proceed through the parietes of the abdomen in an

oblique passage about two inches and a half long. This passage, which is named the inguinal canal, being formed through the fasciæ and muscles that constitute the abdominal parietes in the hypogastric region, the connections of which have been variously described, and are still differently regarded, it seems necessary to enter into some anatomical details on the subject. Before doing so, it may be proper to observe that the part of the abdomen to be particularly considered at present is that which lies below a line drawn transversely between the anterior spinous processes of the ilium.

Under the integuments and subcutaneous adipose tissue there is here an expansion of condensed cellular substance, constituting a membranous fascia, named *fascia superficialis*, not very thick, but comparatively strong, and always very distinct. Beneath this lies a strong tendinous expansion usually named the tendon of the *obliquus externus;* but which, instead of being regarded as subordinate to one particular muscle, ought rather to be considered an independent fibrous structure, like the *fascia lumborum*, or the *fascia lata* of the thigh, since many other muscles are attached to it besides the external oblique. Much confusion would thus be avoided; and it might be called the tendinous fascia of the abdomen. Within this the recti muscles occupy the space on each side of the mesial plane, as far as a line running parallel with it upward from the tuberosity of the pubis. The internal oblique and transverse muscles cover the remainder of the region under consideration, except a small triangular portion of it near the pubis. On the inner side of this muscular layer there is a fascia, which was first noticed and described by Sir A. Cooper. It is very thin, except at the lower part, and has been named the *fascia transversalis;* the peritoneum comes next, and completes the formation of the abdominal parietes. The three fasciæ that have been mentioned are united together at the line which extends from the spinous process of the ilium to the pubis. They may all be traced distinctly down thus far, but cannot be separated lower without cutting them. The *fascia tendinosa* (tendon of the external oblique), before uniting with the others, turns back upon itself downward, so as to present a thick round border like a hem, which has led to the appellation of ligament (Poupart, Fallopius) to this part. The internal oblique and transverse muscles lie

between the *fascia tendinosa* and *fascia transversalis*. Their fibers at this part are intimately connected, and constitute but an inconsiderable mass of muscular substance; they are attached to the junction of the fasciæ all the way from the spinous process to about a third of its length from the pubis. The *vas deferens* and other vessels which compose the spermatic cord meet together on the outer surface of the peritoneum, about midway between the spinous process and pubis, and about half an inch above Poupart's ligament. They here perforate the *fascia transversalis*, not through a well-defined aperture, but by carrying a thin funnel-like projection of it along with them. Descending obliquely toward the pubis, they become united with some fibers of the internal oblique and transverse muscles, which constitute the cremaster muscle. Having thus escaped from under the edge of these muscles, the cord passes through the *fascia tendinosa* at a sort of slit-like opening about an inch and a quarter long, that extends from the tuberosity of the pubis, between the body of the fascia and its inverted margin. From the edge of this slit, which is named the external ring, a thin fascia is continued over the cremaster muscle; and the cord then proceeds into the scrotum, covered by an extension of the superficial fascia of the abdomen, which is continued along with it. The epigastric artery rises from the iliac nearly opposite Poupart's ligament, and running in the direction of the umbilicus, between the peritoneum and *fascia transversalis*, crosses the cord about the middle of the inguinal canal, having nothing interposed except the fascia just mentioned.

Inguinal hernia either descends along the whole course of the cord, or protrudes directly through the external ring. In the former case it is named Inguinal or External Inguinal, and in the latter Ventro-Inguinal or Internal Inguinal. Whether of the one kind or the other, it may either remain confined in its extent to the groin, or, getting lower down, distend the scrotum or labium. In the first of these situations it is denominated Bubonocele, and in the others Scrotal or Pudendal Hernia, according to circumstances. There is an important modification of inguinal hernia which takes place before the cavity of the *tunica vaginalis* ceases to communicate with that of the abdomen. The neck of this process of the peritoneum usually becomes impervious soon after the

descent of the testicle, which generally happens about a month before the time of birth. But if the obliteration is delayed longer, or the fœtus is subjected sooner than this to the circumstances which induce the formation of hernia, the viscera are apt to descend into the same bag with the testicle, so that the sac is formed by the *tunica vaginalis*. The merit of detecting this Congenital hernia is usually ascribed to Percival Pott, but unjustly, as Haller first discovered the descent of the testicle and continuity of the *tunica vaginalis* with the peritoneum, and also suggested the probability of hernia in infants taking place in that way, while Dr. William Hunter first established the truth of this explanation by dissection. There is another very rare form of inguinal hernia, in which the protruded intestine pushes the peritoneum before it *into* the *tunica vaginalis*, so that the sac lies within another sac. I have met with this condition only on one occasion, but then in the most perfect form. The contents of inguinal hernia usually consist of a portion of the ilium, with more or less of the omentum. Sometimes the *caput cœcum* descends by a gradual extension of its cellular connections, and in this case the intestine of course is not completely inclosed in a sac. The sigmoid flexure of the colon also may be protruded, and, though more apt to descend on the left side, has been found on the right, while there are not wanting instances of the *caput cœcum* being discovered on the left. The Hernia is named Enterocele, Epiplocele, or Entero-epiplocele, accordingly as it contains intestine or omentum alone, or both together. There is no limit to the size of the protrusion, which varies from mere fullness in the situation of the inguinal apertures, to a size nearly equal to the whole intestinal canal.

The causes of hernia may be divided into those which predispose to the disease, and those which immediately give rise to it. The predisposing causes are circumstances which diminish the resistance that opposes the exit of the viscera. Of these the sex of the patient may be mentioned first, since the larger size of the inguinal canal in males renders their predisposition to the disease greatly superior to that of females, so that the proportion which the cases of the former bear to those of the latter is at least a hundred to one. Emaciation and relaxation of the body diminish the resistance remarkably, and some persons seem to

labor under a natural peculiarity of structure that exposes them more than others to the disease. The exciting causes consist in the operation of more than usual compressing force acting on the viscera of the abdomen. Such force is exerted during every energetic effort, especially if made with the superior extremities; since, to give the muscles of the arms firm points of attachment, the chest must be rendered immovable, and this is done by contracting the diaphragm together with the abdominal muscles, while the glottis is kept closely shut. The viscera, being thus compressed between the diaphragm and abdominal muscles, are violently forced against the whole surface of the cavity, and if any weak part exists in it, a protrusion takes place. This effect is most apt to happen when an effort is made in the erect posture, for the diaphragm, which then extends obliquely downward and backward, will consequently press the viscera downward and forward in the direction of the inguinal openings. An attention to the same circumstance will afford some explanation of the fact that inguinal hernia occurs much more frequently on the right than the left side, the reason of which appears to be that, when an effort is made, the trunk of the body is usually bent to the opposite side, and, as most vigorous efforts are made with the right arm, the diaphragm will on such occasions generally present its concave surface, and consequently press toward the right groin. Tight articles of dress, which compress the abdomen and increase the confinement of its contents without strengthening the parietes at the natural apertures, promote the occurrence of hernia.

The symptoms of inguinal hernia cannot be properly described or understood without considering separately three different states in which the disease may exist. In the first of these, the viscera return into the abdomen when the patient assumes the horizontal posture, or when moderate pressure is applied to the tumor. The hernia is then said to be Reducible. In the second state, the viscera are detained in the sac, but produce no further inconvenience, when the hernia is said to be Incarcerated. And in the third, the viscera are not only prevented from leaving the sac, but suffer in it such pressure or constriction as impedes the exercise of their functions, and produces other bad consequences, in which case the hernia is said to be Strangulated.

The symptoms of Reducible inguinal hernia are—a tumor in the region of the inguinal canal, colorless, elastic, and compressible, which disappears when the patient lies down, or when moderate pressure is applied; and a gurgling noise or sensation when the viscera return into the abdomen. The circumstances which occasion Incarceration are—1. Thickening and hardening of the omentum, which comes to resemble the pancreas or even denser structures; 2. Adhesions between the viscera and sac; 3. Distention of the gut with intestinal matters; and 4. The peculiar condition of the *caput cæcum*, which cannot return, except slowly, in the same way it descended, by gradual extension of its cellular connections. The presence of a colorless elastic tumor, of unequal consistence, in the region of the inguinal canal, together with the history of the case, distinguishes the disease. Strangulation depends upon the pressure which is caused by the tough fibrous margin of the inguinal apertures or the condensed neck of the sac. The viscera may begin to suffer from the constriction immediately after their protrusion, or may not do so until long afterward, on the occasion of another portion being suddenly forced down into the sac, or from the intestine becoming gorged with its contents. The symptoms of strangulation are a twisting burning pain referred to the umbilical region, constipation, sickness, and vomiting. The patient's countenance is collapsed, pale, and anxious. His pulse is small and feeble, his extremities are cold, and he cannot rest. The constipation does not depend altogether, as might be supposed, on mechanical obstruction of the bowels, since it is observed where the omentum alone is contained in the hernia, and does not always prove obstinate where the intestine is concerned. It seems to be owing chiefly to the perverted action of the gut consequent on the pressure which it suffers. At first there is little pain referred to the seat of the disease; but if the patient is not relieved, inflammation commences, and then the tumor becomes red, tense, painful, and tender to the touch. This inflammation may extend inward and prove fatal, like peritonitis proceeding from any other source, or it may remain confined to the protruded viscera, and, perhaps leading in the first instance to effusion of lymph, terminate in their mortification, when the patient either dies, or recovers with a preternatural opening of the gut at the groin. The time re-

quired for the completion of this process varies extremely in its different stages. It is observed to proceed most rapidly when the patient is young and stout, and when the hernia is small and recent. It is generally more slow in opposite circumstances, but many exceptions occur, and it is never possible to predict with any precision the time that will elapse before inflammation and its consequences are induced. Mortification rarely takes place sooner than eight hours, or later than eight days after the strangulation has commenced.

The treatment of Reducible hernia consists in the use of means proper for obviating the predisposing and exciting causes of the disease. With this view the inguinal region of the abdominal parietes should be strengthened by the mechanical support of a bandage. A timely use of this apparatus may prevent the occurrence of hernia in persons whose predisposition to the disease is manifested by a fullness perceptible in the groin during the impulse of coughing, and by a painful sensation at the same part whenever the viscera are subjected to more than usual pressure, as in making exertion with the arms, or speaking loud. The predisposition being thus guarded against, all sources of excitement must be carefully avoided. The patient should abstain from every sort of food that, by producing flatulence, causes distention of the bowels; he ought to correct any tendency that may be observed to accumulate in the intestinal canal; and he should never engage in exercises or employments that require severe bodily exertion. In the treatment of congenital hernia, it is of great consequence that the truss should be applied as early as possible, in order that the natural disposition which the parts concerned have to close at the time of birth may be allowed to exert its effect, and a radical cure be thus obtained. Beyond this age, if a bandage is ever required, it can very rarely be afterward dispensed with.

Various attempts have at different times been made to remedy the tendency to protrusion by operative procedure, but of these it is needless to mention more than the one some years ago proposed by Professor Wützer, of Bonn. This was to invaginate the scrotal integument by pressing it up the inguinal canal, retain it there by passing a needle through it, together with the margin of the external ring, and then keep all the parts concerned in this

condition by a very complicated apparatus, until the adhesive process was so far advanced as to render it unnecessary. Approving of the principle—but disliking the complexity of this method—I have endeavored to simplify it by employing merely a piece of bougie, gutta-percha, or other solid substance sufficient to fill the hollow of the invaginated integument, with a double thread attached to one of its extremities, and a curved needle in a fixed handle. In performing the operation by means of the needle guided along the finger, which is introduced fairly within the abdominal ring, first one of the threads and then the other is passed through the edge of the tendon, the bougie is drawn up into its place, and the threads are tied tightly over a little roll of plaster or lint, to prevent ulceration of the skin, the whole being secured by a compress and spica bandage.

In the treatment of Incarcerated hernia, the object should be to remove the obstacles which oppose reduction. The intestines should be unloaded by the free administration of purgatives and injections. If there is reason to suppose that the resistance to the return of the protruded parts depends on thickening and induration of the omentum, which sometimes can be felt through the parietes of the tumor, the patient should be confined to bed, restricted to a slender diet, and depleted from time to time by bleeding or cathartics, with the view of producing, during the general emaciation of the body thus induced, a sufficient diminution of the omental mass to permit the accomplishment of reduction. In the case of adhesions existing between the viscera and sac, the only practicable mode of overcoming the difficulty would be to lay open the contents of the hernia and separate their morbid connections. Operations have accordingly been performed for this purpose, but their almost uniformly fatal results ought to deter all prudent surgeons from repeating such attempts. And if the gentle means above mentioned should prove unavailing, it will be better to advise the patient to be satisfied with such palliation of his complaint as may be obtained from strict attention to the state of his bowels, abstinence from all violent exertions, and the support of a bag truss, than to endanger his life by trying to effect a radical cure with the knife.

The Strangulated condition of hernia being attended not only with extreme suffering, but also with great and immediate danger,

demands the most speedy and decided assistance of the surgeon. His first object is of course to effect reduction; and this he immediately endeavors to perform by a careful manipulation, which is named the Taxis. The patient should be laid reclining, with his shoulders and pelvis slightly elevated, to relax the parietes of the abdomen; and with the same intention, the thigh of the affected side should be bent upward and inward, as the *fascia lata* is thus prevented from causing any tension of the abdominal fasciæ to which it is connected. The hernial tumor is then to be grasped at its neck, and compressed with the points of the fingers and thumb, which at the same time pull it slightly outward. The size of the parts at the ring having been thus diminished, the pressure is to be directed gently but steadily upward, in the direction of the inguinal canal. When, in consequence of this proceeding, the slightest gurgle is heard or felt, or the size of the swelling is perceptibly diminished, the reduction, in general, may be very soon completed. The larger the hernia is, the more may be expected from this manipulation, and *vice versâ*. There is almost always some serous effusion into the cavity of the sac, and in small tumors, especially those of recent production with acute symptoms, the bulk of the fluid bears a large proportion to that of the intestine or omentum. External pressure, consequently, however carefully employed, cannot possibly have its effect confined to the neck or any other portion of the strangulated parts, since, through the medium of the fluid, its force must be diffused over the whole surface, and therefore urge the entire mass against the narrow aperture by which it is required to return. While circumstances are thus opposed to the beneficial influence of pressure from without, it is obvious that the small size of the protrusion, which is often not larger than the point of the finger, and seldom exceeds that of a walnut in most cases, will afford little resistance to an effort in the opposite direction. It accordingly often happens that after the taxis has failed, the tumor suddenly, and, as it seems, spontaneously, disappears, no doubt through the operation of some internal change in the condition of the bowels or omentum.

Such being the case, in the event of the taxis failing, it is obviously proper to use means that may produce some effect of the kind requisite for *withdrawing* the protruded parts into the

abdominal cavity. Of these may be mentioned a change of posture, by elevating the pelvis and bending the shoulders backward, in order to make a drag on the strangulated viscera, together with the administration of enemata to evacuate the intestines and thus lessen the resistance to return. Bleeding largely to diminish the contractile tone of the muscular fibers—using the warm bath with the same view—and in addition to it also employing opium or tobacco, with the application of cold externally, and the internal use of tartrate of antimony, or purgatives, were formerly resorted to, but have been superseded by the more efficient and less objectionable agency of chloroform.

The choice of means for the purpose of promoting reduction must be determined by the circumstances of the case. When the patient is strong or plethoric, it will always be right, in the first instance, to abstract a considerable quantity of blood. Repeated injections, or the warm bath if it can be procured, should also be employed. The bowels having been thus, if possible, unloaded, and the spasmodic tension of the abdominal muscles, which is caused by the irritation of the disease, and reacts injuriously upon it by tightening the fasciæ which produce the stricture, having been subdued or diminished, the taxis is again to be tried. If it should fail, in the more favorable circumstances that now exist, the surgeon must think of removing the resistance by dividing the stricture with the knife. It is difficult to determine how long the operation may be safely deferred, as inflammation and gangrene supervene much more quickly in some cases than in others. The best course is to operate so soon as a fair trial has been given without success to the taxis, and the measures which promote it, especially bleeding, and the warm bath if it can be procured. It should be recollected—1. That the danger of the operation itself is very inconsiderable; and that, consequently, the patient should not, from fear of incurring it, be subjected to the greater risk, or rather almost certainty, of a fatal issue, which attends the disease when allowed to follow its own course. 2. That the progress of the bad consequences is usually rapid, in proportion as the hernia is small, recent, and tense. 3. That in small recent hernias there is least advantage to be expected from waiting. 4. That in large hernias, strangulated in consequence of congestion, there is most assistance to be looked for from the

continued use of purgatives and injections. 5. That the operation is attended with least danger in cases where the tumor is small and recent; and with most where it is large and of old standing.

When the operation is judged necessary, the patient should be brought to the edge of his bed, so as to present the groin in a favorable position. His shoulders ought to be elevated a little, and the thigh of the affected side is to be slightly bent. The operator having shaved off the hairs, makes an incision about three inches long, in the direction of the inguinal canal, beginning rather above the commencement of the tumor, and continued down the middle or most projecting part of it, toward the bottom. This incision is most conveniently accomplished by lifting up a fold of the integuments, together with as much as possible of the loose cellular tissue exterior to the tense parietes of the tumor, and running the knife through it with the back turned toward the sac. If the superficial epigastric, or any other artery of the integuments which may have been cut, threatens to bleed much, it should be tied before going further. The surgeon has then to divide the layers of fasciæ which cover the sac; and the old method of doing this was to cut them successively upon a grooved director thrust under them, so as to elevate portion by portion. Instead of a practice so tedious and perplexing, it is better to dissect through the coverings by raising them with the forceps, cutting the fold thus elevated with the knife held parallel to the sac, and then dividing each layer in succession, upward and downward, to the extent of the external incision. In general the peritoneum may be recognized by a bluish appearance which it presents, owing to the presence of fluid contained within it, and by its more loose connections than those of the superjacent parts; but these characters are deceptive; and it is fortunately not necessary that this recognition should be effected previous to opening the sac. If it is opened in the same way that has been recommended for cutting through the fasciæ, there will be no danger of wounding the contained viscera; and so soon as they are exposed, the dark color of the intestine, and the smooth glistening internal surface of its peritoneal covering, which contrasts remarkably with the rough and bleeding external surface of the sac, and those of the fasciæ, independently of any other signs, will at once assure the surgeon that he has opened the sac. When the hernia is small, its cover-

ings and the sac ought always to be divided first at the fundus, or bottom of the tumor, as they are there most apt to be separated from the intestine by serous fluid, which is almost always present in more or less quantity, and sometimes constitutes the principal part of the swelling. In a small hernia, also, the sac should be opened throughout its whole extent; but if it is large, merely such a portion of its neck as may be sufficient for allowing the stricture to be reached and divided. If the presence of fluid could be depended upon there would be no danger in opening the sac; but as it is occasionally, though certainly very seldom, absent, so that the peritoneal covering lies in close contact with the strangulated parts, it would be extremely imprudent in any case to operate with reliance on the protection which is thus not certainly afforded. The safest mode of proceeding is to pinch up a small portion of the sac with the forceps, and then to divide it, holding the knife parallel with the surface of the tumor. Wherever an aperture, however small, is made, fluid, if any is contained in the cavity, escapes, and the smooth shining surface of the contained viscera is readily recognized. While the forceps still retain their hold of the membrane, a blunt-pointed curved bistoury should be introduced and carried to the requisite extent, with the additional protection of the operator's finger interposed between it and the intestine.

After the protruded viscera have been exposed, the next step of the operation is to divide the stricture. This might be done in any direction, were it not that the epigastric artery and spermatic cord, lying in the neighborhood of the neck of the sac, limit the choice within more narrow bounds. When the hernia protrudes through the internal opening of the canal, it is seated anteriorly to the cord, and has the epigastric artery on the pubic side of its neck. In cases of old standing, where the tumor attains a large size, the spermatic vessels are sometimes separated from each other, and found on the lateral, or even anterior part of the sac. In such cases, too, the obliquity of the canal becomes much diminished, and it is often at length impossible to tell, by external examination, whether the hernia is external or internal; in other words, whether it has passed through the whole course of the canal, or escaped directly through the external ring. When it is of the latter or ventro-inguinal kind, the cord lies on the iliac

side of its neck, behind which it crosses obliquely downward, and the epigastric artery is also on the same side running upward and inward. It appears, therefore, that if the stricture were divided by cutting toward the pubis, the epigastric would be endangered in the former case; and that, if the knife were carried outward, it would in the latter subject both the epigastric artery and the cord to the risk of injury. As it is often difficult, and sometimes impossible, to ascertain positively, either from the examination of the tumor or from its previous history, whether the vessels are situated on its iliac or pubic side, the safest plan is always to cut upward, in which direction there can never be any risk incurred. The simple probe-pointed bistoury, which has been employed for the preliminary part of the operation, is the most safe and efficient instrument for dividing the stricture. The surgeon should introduce the fore-finger of his right or left hand, according to circumstances, between the sac and viscera as high as he can, and then, feeling the stricture with its point, carry up the knife with its side turned toward the finger, until it is insinuated between the intestine or omentum and the sac, when, turning its edge upward, he raises the handle gently but steadily, and repeats this process until he perceives that there is a free passage for his finger into the abdomen.

The late Mr. Aston Key, and Mr. Luke of London, have endeavored to lessen the danger of the operation by dividing the constriction without opening the sac. The advantages attributed to this procedure, from leaving the serous membrane entire, seem more than counterbalanced by the risk of wounding the intestine in dividing the stricture, the evils which may result from returning the strangulated parts in an improper condition, and the mischief that may arise from abortive efforts to effect reduction, when it is impeded by adhesion or other obstacles within the sac. On the whole, I am inclined to think that, as a general rule, it is better to open the sac; and that the procedure in question should be restricted to the treatment of large hernial protrusions when the bad consequences of opening the sac are greatest, and the difficulty of dividing the stricture smallest.

The third step of the operation consists in the management of the protruded viscera. If the hernia is recent, and inflammation has not been excited, the intestine and omentum present nearly

their usual appearance, except that the former is more or less thickened in its coats, and has a dark, purple, or brownish color. In such circumstances, the gut should be returned first by gentle pressure, similar to that employed in the taxis, and then the omentum. If effusion of lymph has taken place on the surface of the intestine in consequence of inflammation, the reduction may be performed as in the former case, but, of course, with a less favorable prognosis. If old adhesions, existing between the surfaces of the intestine, or between them and the sac, oppose reduction, they ought to be divided when this is practicable, and when it is not, the parts must be left to themselves; the integuments being brought together, or simply covered by a pledget of ointment. It might be expected that more of the intestine would thus be permitted to escape, but it is found that when the stricture has been freely divided, the functions of the bowels restored, and the patient confined to the horizontal posture, the protrusion gradually diminishes, and finally withdraws itself into the abdomen. The same practice is proper when the *caput cœcum* has descended. Should the omentum be so thickened and indurated as not to permit reduction, it may be cut away as far as is necessary, any vessels that require ligatures being tied. But from what has fallen within my own observation, I am inclined to think that it is better to leave the omentum in the sac than to practice excision of the indurated portion, since there is thus incurred a risk of several bad consequences. In the *first* place, whether from the wound alone or the ligatures, which are frequently required in considerable numbers, inflammation is apt to be excited; and, *secondly*, that most troublesome and dangerous occurrence, ulceration of the intestine, is apt to happen, probably from the bowel adhering to the wounded part of the omentum and losing the protection of its serous covering, which is slow to undergo the ulcerative process. Lastly, when the intestine is discovered by its soft consistence and fetid odor to be in a mortified state, any attempt at reduction would be highly imprudent, since the patient's only chance of escape from the fatal effusion of its contents into the abdominal cavity depends upon lymph being thrown out and around the mouth of the sac. If this barrier be broken up, death will inevitably happen, and therefore the surgeon should either leave the contents of the hernia as he finds them, or limit his interference

to laying the gut freely open, if it is not so already, after which a soft poultice, or pledget of emollient ointment, may be placed on the part. After the operation, unless circumstances should require the wound to be kept open, its edges ought to be drawn together by stitches, and have a thick compress of folded lint supported by a bandage applied over them.

When things go on well, the patient experiences relief almost immediately after the operation. The tormenting pain of the umbilical region, the sickness, and the vomiting subside, the warmth of the body becomes uniformly diffused, the anxious expression of the countenance disappears, and a full, soft, moderately frequent pulse gives further indication of the salutary change that has taken place. In the course of an hour or two, one or more, usually several, copious evacuations of the bowels show not only that the gut has been relieved from mechanical obstruction, but that it has been restored to the due performance of its functions. Tenderness of the abdomen, or uneasiness felt in it independently of pressure, will suggest the immediate application of warm fomentations; and if it should increase, or be accompanied with acceleration of the pulse, heat of skin, thirst, anxiety, or restlessness, general bleeding and leeching of the abdomen must be resorted to without delay, decidedly and freely, so as if possible to subdue the incipient peritonitis. Opium and calomel ought at the same time to be administered in doses proportioned to the urgency of the circumstances. In consequence, probably, of the pressure which has been sustained by the gut while strangulated, and which there is reason to believe generally occasions a certain degree of constriction in the canal for a considerable length of time subsequent to reduction, the patient is frequently annoyed for days or weeks with occasional symptoms of chronic inflammation, for which gentle aperients, administered by the mouth and rectum, leeching, and the counter-irritation of blisters are the best means of counteraction. It is not prudent to get out of bed, or, at all events, to quit the horizontal posture, until the wound is so far healed as to permit the wearing of an efficient truss, which can hardly ever afterward be dispensed with.

When sloughing of the contents of the hernia takes place, a discharge of the intestinal matters always ensues for a time through the opening thus established in the gut. The cavity of the sac

gradually diminishes, its orifice contracts, the integuments surrounding it become callous, and a preternatural anus is formed. If only a part of the circumference of the intestine has been protruded, the remaining portion allows some of the contents of the canal to descend naturally, and by degrees more of them, until little and at last none are voided in the groin, the opening of which closes, and then the patient obtains a complete cure. This process of reparation is accomplished with difficulty, in proportion to the extent of gut that has been destroyed; and when its whole circumference has sloughed, a complete loop of the intestine having been strangulated, it can hardly be effected without some artificial assistance. In this case the two contiguous walls of the gut constitute a septum which directs the flow of matters passing through the canal so as to make them issue at the preternatural orifice; and sometimes the upper part of the tube becoming inverted, protrudes through it, so as to form a tumor of various size in the groin. Different methods have been employed for dividing the septum, and thus promoting the natural changes that lead to recovery. Incision is dangerous from the risk of cutting too much, and allowing the intestinal matters to be effused into the cavity of the abdomen. A ligature passed through the septum by means of a needle, which was first thought of by Dr. Physick of Philadelphia (1802), is more safe in the first instance, but must subject the patient to the chance of symptoms similar to those of strangulated hernia; and the plan of M. Dupuytren (1813) seems to be on the whole the best. It consists in compressing the septum between the blades of forceps made to meet very accurately, the one being received into a groove of the other and regulated in their approximation by a screw. The pressure is thus completely under control, and can be increased, diminished, or altogether withdrawn, according to circumstances.

The sloughing of a hernia is not the only cause of preternatural anus. It may be produced also by ulceration of the intestine after it has contracted adhesions to the parietes of the abdomen, or by wounds. It is always a source of extreme annoyance, and sometimes occasions dangerous symptoms, by the aperture proving inadequate to discharge the contents of the gut, while they are prevented from descending by their natural route. The treatment, therefore, deserves much attention. In the first instance,

it is sufficient to keep the part clean, and prevent eversion of the upper extremity of the gut by applying gentle pressure, which is also useful by directing the feculent matters into their old channel. If the gut has become everted, it ought, if possible, to be immediately reduced; and in case this cannot be accomplished, its more gradual return must be promoted by permanent pressure, slender diet, and the horizontal posture. Should the aperture not contract, though there is no protrusion of the intestine, it may be concluded that a septum exists between the two extremities of the tube above or below the aperture; and its situation having been ascertained by careful examination, the compressing instrument of Dupuytren is to be cautiously employed. The blades of the forceps should be at first very gently approximated, and never tightened so as to occasion any disagreeable symptoms. When the piece included is detached by ulceration and the forceps fall off, the case must be treated by gentle pressure and attention to the bowels, as if the septum had not existed.

Femoral Hernia.

The femoral vessels descending along the inner margin of the *psoas magnus* rest upon a fascia which covers that muscle, together with the neighboring *iliacus internus*, and also lines the cavity of the pelvis. This *iliac fascia*, as it is named, is united to the *fascia transversalis*, so as to appear quite continuous with it when both are brought into view by stripping off the peritoneum from the inner surface of the abdominal parietes. They leave, however, an oval aperture to let the vessels pass through them, which it is necessary to consider particularly. The union of the two fasciæ is continued from the pubis for about an inch and a half toward the ilium, in the direction of the *linea ileo-pectinea*, where it terminates by a sort of crescentic margin that is seen very distinctly when the parietes are held up and surveyed from the inner side, after the peritoneum has been removed. Where the fasciæ thus meet together, they are intimately and inseparably connected with the reflected margin of the tendinous fascia of the abdomen (tendon of the external oblique) which is attached to the tuberosity and crest of the pubis, and also with the superficial fascia of the abdomen, together with the *fascia lata*

of the thigh. On the iliac side of this crescentic margin, with the interposition of some loose cellular substance and fat, the vessels lie, resting on the *fascia iliaca*, which here becomes attached to the bone, and covered by the union of the three abdominal fasciæ, which form a bridge over them that has been named the crural arch. Between the vessels and spinous process the iliac and *transversalis fasciæ* again unite, and allow the *iliacus internus*, together with the *psoas magnus* muscle, to pass under them to the *trochanter minor*. The fasciæ are here closely connected with the vessels, or rather with their sheath of dense cellular substance, in which they insensibly lose themselves when traced by dissection. The vessels are now, properly speaking, in the thigh, and become covered with the *fascia lata*, which has an oval aperture in it on their pubal side, immediately below Poupart's ligament, through which the *vena saphena* finds access to the femoral trunk. The *fascia lata*, at the margin of this aperture, loses itself on the sheath of the vessels. On their pubal side it passes up, resting on the pectineus muscle, and becomes continuous with the iliac fascia; and on the iliac side, while uniting directly with the abdominal and pelvic fascia, it sends a falciform process inward over the vessels to the pubis, so as thus to enter into the formation of the crural arch throughout its whole extent. It thus appears that the femoral is separated from the inguinal canal merely by the *fascia transversalis* and reflected margin of the tendinous fascia (tendon of the external oblique).

When the viscera protrude through the space between the vessels and crescentic margin of the crural arch, they constitute what is called a Femoral Hernia. The sac in this case is covered by no fascia, properly speaking, having superjacent to it merely the loose cellular substance which occupied the passage, and the thick mass of cellular substance, glands, and fat which lies in the triangular hollow at the upper part of the thigh between the pectineus and sartorius muscles. This irregularly laminated and tough tissue, when stretched by the tumor, often presents, on dissection, the appearance of layers, but these are very variable in number as well as thickness, and cannot be distinguished in an operation. The fasciæ, therefore, are interesting in regard to femoral hernia, merely in so far as they constitute the stricture that opposes the reduction of the bowels.

The causes of femoral, like those of inguinal hernia, are predisposing and exciting. The predisposition to femoral hernia is nearly as much greater in the female as that to inguinal hernia is in the male, owing to the breadth of the pelvis in the former sex and the consequent width of the female apertures. The exciting circumstances are similar to those that have been mentioned, but are apt to be assisted in their operation by the distended state of the abdomen to which females are liable from pregnancy; and many of the femoral hernias which occur in practice are accordingly referred to the violent expulsive efforts of parturition. The ilium and omentum are the parts usually protruded. The tumor is generally of a small size, and sometimes can be discovered only by feeling in the situation where it is suspected. On account of this circumstance, which is apt to conceal the disease from the patient, and also because females are apt to be prevented by feelings of delicacy from disclosing its existence, it is prudent on all occasions, where symptoms indicative of hernia are complained of, to insist upon an examination of the groins.

The diagnosis of femoral hernia is often more difficult than that of inguinal. When reducible, it may be confounded with psoas abscess pointing under Poupart's ligament, and in the two other conditions of incarceration and strangulation it is frequently distinguished with difficulty from swelling or inflammation of the inguinal glands. If the tumor depends on a reducible hernia, it will disappear under moderate pressure, or by assuming the horizontal posture; but if it is owing to a collection of matter, though lessened perhaps, it will not be entirely removable by pressure, however carefully applied, so long as the patient remains erect. From chronic swelling, or acute inflammation of the glands, it may be distinguished by the thickness and fixture of its neck—its more smooth and globular surface—and generally by its history. If a hernia, the tumor will either have existed for a length of time previously, and given indication of its nature by some of the characteristic symptoms, or have appeared suddenly in consequence of a violent exertion. Glandular swellings again, if chronic, will probably have had their nature ascertained, and if recent, are usually connected with some source of irritation that leads to their recognition. It is important, however, to know that the glands *may* become suddenly large and painful in conse-

quence of the strain from a violent effort, in which case sickness, vomiting, and constipation are not unfrequently induced by the irritation. Enlarged glands also occasionally exist along with a hernia, and render its diagnosis by examination extremely difficult, or even sometimes impracticable. In all cases of doubt, when other means fail in affording relief, it is the duty of the surgeon to cut down upon the swelling and ascertain its nature. The symptoms of femoral are the same as those of inguinal hernia. But it is observed that the bad consequences of strangulation are particularly severe and rapid in their progress, which is no doubt to be ascribed to the small size of the protruded portion of intestine and the extreme tightness of the stricture.

The treatment of femoral hernia is to be conducted on the same principles which have been fully explained above. If it is reducible, a truss should be carefully worn; and it is here even more necessary than in obviating the predisposition to inguinal rupture to fit the bandage properly. The cushion should be more convex, and it may be requisite to prevent its displacement upward by an additional strap passing round the thigh. When incarcerated, it should be subjected to the measures that favor reduction; and if it resists, must be prevented as much as possible from increasing by the compression of a suspensory bag. It may be observed that femoral hernia is rarely met with in this state. Lastly, in case of strangulation, the taxis, together with its subsidiary means, if necessary, must be had recourse to without delay, so that no time may be lost in dividing the stricture if this should prove the only resource.

In performing the operation it is generally better, on account of the smallness of the tumor and thickness of the superjacent parts, to make, instead of a simple incision, one of the figure of the letter T. The transverse part of it should be as high as the neck of the swelling, that is, close to Poupart's ligament, and is most readily effected by lifting up a fold of the skin, together with as much as possible of the parts below that can be separated from the sac, and running a knife through it with the back turned toward the sac. The surgeon may then cut safely from the center of this incision downward, to the same depth with it. He next lays aside the two small flaps thus formed, and proceeds to expose the sac, by raising and dividing with the forceps and knife the

layers of condensed cellular substance which cover it. If glands come in the way, they must be dissected off the hernial tumor; and when the sac is approached, the operator should be particularly careful to elevate the layer he wishes to divide at the fundus or most projecting part of the bag, as there is here most fluid between it and the inclosed intestine. In cases of femoral hernia requiring operation, the contents of the tumor are almost always recently protruded, and therefore seldom present those adhesions or other morbid alterations which frequently render the inguinal operation so embarrassing.

The direction in which the stricture should be divided has afforded fruitful subject of discussion. If the knife is carried upward so as to cut through the crural arch, it must evidently endanger the spermatic cord or round ligament. This, therefore, which was the old operation, is decidedly objectionable. Gimbernat of Madrid observed (1793) that the stricture in femoral hernia on the pubic side of the neck of the sac was not situated, as had been erroneously believed before, at the tuberosity of the pubis, but at the distance of between one and two inches from it, and was formed by what is now called the crescentic margin of the crural arch. The attachment of the fasciæ to the bone, between this point and the tuberosity of the pubis, has been named Gimbernat's ligament—an appellation which, by conveying the idea of a distinct independent structure, has occasioned much confusion. Having ascertained this important anatomical fact, Gimbernat introduced a new method of relieving the stricture, which was to cut inward from the neck of the sac toward the pubis. He operated very rudely, by passing a grooved director and bistoury between the intestine and stricture into the abdomen, and then separating them so as to make a very free division of the fasciæ, and thus endanger the bladder, or even the uterus if distended. The principle of the operation, however, being good, was adopted in practice, and would probably long ere now have been invariably acted on, were it not that, in *post-mortem* examinations of femoral hernias, the obturator artery has been found rising from the epigastric or external iliac and encircling the neck of the sac. This origin of the artery is now ascertained to be far from unusual, but there is reason to doubt that the vessel will often allow the hernia to protrude between it and the trunk from which it rises, so as to

lie on the pubal side of the sac and be in the way of the knife; and even though it were to be so situated, there seems little danger of cutting its coats in dividing the stricture, provided this part of the operation be properly performed. The tumor, which is generally very small, depends principally on fluid accumulated in the sac, and the portion of intestine subjected to strangulation is often no larger than the point of the finger; but even though it should equal in size a pigeon's egg, which it seldom exceeds, a very slight dilatation of the stricture is sufficient for permitting reduction. Instead of the coarse and dangerous procedure of Gimbernat, therefore, the division of the tight edge of the fasciæ should be effected very gently and cautiously. The surgeon having introduced his fore-finger into the sac close up to its neck, with the nail turned toward the intestine, feels for the crescentic margin of the fasciæ, or rather for its situation, since in cases requiring an operation the stricture is too tight to permit the smallest part of the finger to be passed through. He then carries up a blunt-pointed slightly-curved bistoury along his finger, toward which the flat side is turned, and carefully insinuates its point within the stricture, which being accomplished, he turns the knife so as to direct the cutting edge to it; and if sufficient dilatation is not thus obtained, he presses the edge of the knife on the tense fibers without using any sawing motion. As room is gained, he presses his finger gradually forward until he feels that the point is fairly within the abdominal cavity, when he may be sure that enough has been done. It often happens that, immediately upon the return of the protruded viscera, a quantity of serous fluid escapes from the abdomen, which has an alarming appearance, but is not of the slightest consequence. The after-treatment of the patient should be conducted on the same principles which have been explained in regard to inguinal hernia. It may here not be improper again to notice the question whether, in operating for hernia, it would not be better to relieve the stricture without cutting into the cavity of the peritoneum. The advantage contended for in favor of the latter practice is its lessening the risk of inflammatory consequences. In opposition to it many strong objections will readily appear—as, in the *first* place, the difficulty, or rather impracticability, of safely dividing a tight stricture without the assistance obtained from introducing a finger into the sac as a

guide for the knife; *secondly*, the inefficiency of pressure to reduce the protruded parts, unless the orifice through which they have escaped be rendered very free indeed, so long as it operates through the medium of fluid contained in a bag; *thirdly*, the fear of returning the sac along with the viscera, in which case strangulation may still be maintained by its narrow neck; *fourthly*, the ground for believing that the neck of the sac is in general much concerned in causing the strangulating constriction, so as to require division no less than the fascial stricture itself; and, *lastly*, the chance of returning the intestine in a state improper for reduction, or of being foiled in doing so from adhesions or other morbid changes, requiring free inspection, and the use of the knife for their removal.

Umbilical Hernia.

Children are sometimes born with a malformation of the abdominal parietes, which exposes the peritoneum of the epigastric region to view, and allows the viscera to protrude, notwithstanding any pressure that may be employed to prevent them from doing so. Such imperfectly formed beings generally die soon after birth; and if they survive, must labor permanently under the inconvenience which attends the unprotected condition and displacement of their bowels; all that art can do being to afford some mechanical support, where the parietes of the abdomen are defective, by means of a firm case of leather or other suitable material. But, independently of this defective structure, the viscera may be protruded through the umbilical aperture, or passage for the vessels of the fœtus, the thin skin which is formed after the separation of the cord being distended by the sac of peritoneum. Such an occurrence can take place only within a short period after birth, since the umbilical opening subsequently becomes obliterated, and occupied by a firm unyielding cicatrix. Hernia occasionally appears in the adult near the umbilicus; but then it is always situated in a preternatural aperture, and is said to be Ventral. True umbilical hernia in the adult is always congenital.

In the treatment of this species of hernia it is of great consequence that reduction should be effected and maintained while the

aperture still retains its disposition to become obliterated, so that a radical cure may be effected, and the patient saved from the necessity of wearing a bandage permanently. In children, where there is no malformation, and merely a relaxation of the umbilical opening, this may in general be easily accomplished by returning the protruded viscera; then placing a conical-shaped compress, such as a nutmeg enveloped with lint, on the opening through which they passed; and, lastly, affording sufficient pressure by applying cross straps of adhesive plaster. This attains the object better than a circular bandage, which necessarily compresses the general cavity of the abdomen, and thus, though it counteracts the predisposition by strengthening the parietes, tends to excite the disease. In the slight degree of this complaint usually met with in infants, which merely presents the appearance of a thimble-like protrusion from the umbilicus, it is not necessary to employ any means of treatment, as the parts soon assume a normal state through spontaneous contraction. In adults such simple measures are not sufficient, and more powerful pressure is required. The best apparatus for the purpose consists of two broad circular cushions, one of which is placed on the back, and the other opposite the seat of the hernia, which may be connected by a spring with any requisite degree of force. Additional security for this bandage can be readily obtained, if found necessary, by means of straps passed under the perineum or brought over the shoulders.

Incarcerated and strangulated umbilical hernia should be treated on the same principles as those which have been explained. When the operation is judged requisite, a crucial incision should be made through the integuments, having the most prominent part of the tumor for its center, unless the hernia is very large, when it will be sufficient to make a simple incision two or three inches long at the base of the swelling, directed toward the center. The sac is to be exposed and opened in the same way that has been already described, and the stricture may be divided on any side, or, what is better, on several sides, so that no one is cut very extensively. The omentum is in this situation apt to cover the viscera, and ought to be carefully disengaged from them before being either cut away or reduced.

Ventral Hernia.

What has been said regarding umbilical hernia will apply in all respects to ventral hernia, with the exception that, as the disease is almost exclusively confined to adults, some powerful means of compression are required. Protrusions of this kind are not common, and when they do occur, are generally situated in the *linea alba* near the umbilicus; but the records of surgery show that they may take place in almost every part of the abdominal parietes.

Hernia Dorsalis, or through the Ischiatic Notch, *Hernia* of the *Foramen Ovale*, and *Hernia* of the *Perineum* are so extremely rare that it does not seem necessary to detail the particulars of the few cases in which they have been observed. In a case of perineal hernia that came under my notice, the patient, a middle-aged female, made a narrow escape, from having the tumor opened instead of an abscess. The swelling was larger than a turkey's egg, and lay between the anus and tuberosity of the rectum.

Internal Hernia.

Under this title are comprehended two conditions, very different in regard to their diagnosis and treatment. In one of them the strangulation is caused by the constriction of some preternatural adhesion or band, which has resulted from inflammation taking place within the abdominal cavity. On such occasions, interference, though occasionally attempted, does not seem warrantable, on account of the obscurity which must prevent the diagnosis from ever being quite certain, the difficulty of disentangling the intestine—often a tedious and operose process, even in the dead body—and the extreme danger resulting from such exposure, handling, and cutting of the viscera. Even in circumstances apparently the most desperate, the chance of spontaneous recovery must exceed that of escape from the effects of an operation attended with so much risk and so little promise of success.

In the other form of the disease, which may more correctly be denominated Internal Hernia, the case is very different, the seat of constriction being the neck of a sac, which may be distinctly

recognized and is safely accessible. This sac is formed by protrusion of the peritoneum through one of the apertures of the abdominal parietes, which constitute the ordinary seat of hernia, more especially that of the inguinal canal, and produces the effect in question by having been reduced into the abdomen together with the portion of intestine contained in it. In one case that came under my care, the sac had not been protruded for many months previous to the symptoms of strangulation, and therefore may perhaps have for some time existed in an empty state. But in general this condition takes place during the period of strangulation, and is effected by external pressure employed for the taxis. The diagnosis is therefore rendered distinct by the symptoms persisting after the tumor disappears, and may usually be confirmed by carefully examining the seat of protrusion, where a sense of fullness or resistance is perceived when pressure is made over the internal tumor.

When the history of the case and the existing symptoms afford ground for believing that the sac has been reduced, together with its strangulated contents, no time should be lost in affording relief. For this purpose, a free incision having been made so as to expose the spermatic cord, the operator introduces his finger through the external ring under the tendinous expansion of the external oblique muscle, and divides it directly upward, with a blunt-pointed bistoury, to the extent of an inch or more, if necessary, to bring the bottom of the sac into view. It generally then protrudes, and admits of being treated as in ordinary cases of hernia; but if it does not do so, even when the patient coughs, may be readily seized with forceps and drawn fairly into view. In the case above alluded to, where the strangulation had taken place within the abdomen, I found no difficulty in executing the process as just described, and with complete success. It is matter of much regret that this mode of relief has been adopted in a comparatively small proportion of the cases requiring it which have hitherto occurred, and in general at a period of the disease so advanced as to preclude any chance of recovery; but the attention which has of late years been devoted to the subject will, it is hoped, render the practice in future more satisfactory and creditable to the art of surgery.

Iliac Abscess.

Collections of matter are sometimes formed in the iliac or inguinal regions, lying between the parietes of the abdomen and the peritoneum. As the gut on the right side is in this situation partly uncovered with peritoneum, there is a risk of ulcerative absorption being induced in its coats by the pressure of the confined fluid, so as to form a preternatural opening into the *caput cœcum*, which may become a stercoraceous fistula if the integuments also give way. To prevent this occurrence, it is right in such cases to make an early aperture. This complaint is met with most frequently in females soon after delivery, but is not confined to this condition; and I have even met with it, though certainly very seldom, in patients of the other sex. The abscess is generally of a subacute character, and, from its insidious formation, is apt to escape recognition.

CHAPTER XVIII.

PELVIS.

Imperforate Anus.

Deficiency or imperforation of the anus is a congenital disease, and exhibits several varieties which must be distinguished in practice. Sometimes the rectum is completely formed, with the exception of having its orifice closed by a thin membrane, which allows the dark color of the meconium to be discerned through it. This obstruction, instead of existing at the extremity of the gut, may be situated a little above it, so as to require the introduction of a finger for its discovery. The rectum is also occasionally found to be deficient at its lower part, becoming nearly or altogether impervious at the distance of an inch or more from where the anus ought to be. In such cases, there is not unfrequently a communication between the intestine above the ob-

structed part and the vagina of the female, or the urinary bladder of the male, the former of which complications has sometimes proved sufficient for affording passage from the bowels during the course of a long life.

The symptoms of imperforate anus are swelling and tension of the abdomen, vomiting, and absence of the usual evacuations from the bowels. If the child is not relieved by having an aperture effected for the escape of the confined feculent matters, it must speedily perish,—and an examination of the rectum should therefore be always instituted without delay, when there are symptoms indicative of obstruction, and more especially when there is no discharge of meconium.

In case of simple closure, without deficiency of the gut, the membrane should be freely divided in a crucial direction, with a probe-pointed bistoury guided on the finger. To prevent contraction of the wound, it will be necessary to introduce daily, until the cure is completed, a tent of lint smeared with some unctuous matter. If there is no appearance of an anus, and the lower part of the rectum is wanting, the prognosis must be very unfavorable, since such a malformation is usually associated with other imperfections of the system; and though it should not be so complicated, is remedied with great difficulty, as the opening made by incision through the integuments and subjacent tissues, even if it reaches the rectum and suffices in the first instance for allowing the evacuations, is very apt to contract, or become almost obliterated, notwithstanding every care that can be taken to prevent it from doing so. The child should be placed upon its back, and have its thighs held up so as to expose the parts fairly to view. The surgeon then makes an incision about an inch in length in the mesial plane, having its posterior extremity about half an inch distant from the *os coccygis*. Making way with the knife, he introduces his finger in the direction of the hollow of the sacrum,—and if the gut is near, he will discover it by the fluctuation of its contents. If he succeeds in puncturing the coats of the intestine, the opening is to be enlarged to a suitable extent, and prevented from closing by the introduction of a tent. But if he fails in finding the gut within the distance of at most two inches from the surface, he need not prosecute the search further. In cases where a communication exists between the

rectum and bladder or vagina, assistance may be derived in discovering the obstructed extremity by introducing a director through the preternatural passage into the cavity of the intestine. There are some cases on record in which life has been preserved by cutting into the colon, but such attempts can hardly be recommended.

Stricture of the Rectum.

Stricture of the rectum sometimes, but very rarely, exists as a congenital imperfection, and almost always depends upon changes in the structure of the coats of the intestine taking place in the progress of life, especially during its middle and later periods. Like stricture of the œsophagus, it may be caused either by simple contraction, with thickening and induration of the gut, or by morbid degeneration of its constituent tissues, in which case the resulting tumor is usually of a carcinomatous nature.

The symptoms of simple stricture are painful and imperfect evacuations of the bowels,—the desire to empty the rectum continuing after the most powerful and prolonged efforts of expulsion,—the discharge of fluid matters with great force, as if from a squirt,—the appearance of the solid evacuations in the form of slender cylinders or small round masses,—and the admixture of a large quantity of mucus, often bloody, with the feculent excretions. The disease generally manifests itself very insidiously, and before long is usually accompanied with a distended state of the abdomen, which is owing partly to retention of the intestinal contents, and partly to a tympanitic condition induced by the irritation. The desire to empty the bowels becomes at length almost incessant, and the frequent attempts which are made to do so being seldom followed by any evacuation except of fluids, there is a risk of erroneously supposing that the patient labors under diarrhœa, and with this view of prescribing astringent or other kinds of constipating medicines, which have a tendency to increase the distention of the intestine. In all cases of doubt, an examination should be made with the finger, to ascertain positively whether or no there be a stricture. It is generally found about two inches or two inches and a half distant from the orifice, and very rarely higher up; although some practitioners allege that

they are able to detect constrictions even in the sigmoid flexure of the colon. But the greatest tact and dexterity cannot insure even a moderate approach to certainty, in exploring the width of a canal so capacious and loosely connected as the upper part of the rectum, as the coats are extremely apt to be pushed before the point of the bougie, and lead to the belief that there is a stricture when none exists. It is often erroneously supposed that a stricture can be felt about five or six inches up the gut, owing to the resistance caused by the promontory of the sacrum to the introduction of a bougie. The difficulty of obtaining satisfactory evidence as to the existence of stricture in these situations is the less to be regretted, as it is almost always seated within reach of the finger, which cannot be deceived; and if beyond this extent, may be deemed quite irremediable. Unless the patient be relieved, general emaciation is gradually induced by the continual distress and derangement of the intestinal functions. Hectic irritation follows, and death may be the ultimate effect, either from gradual exhaustion or from inflammation of the bowels. The progress of the disease is usually very slow, and years may elapse before the symptoms are sufficiently severe to excite attention, their insidious approach rendering the patient unaware of their presence, even when distinctly marked. In carcinomatous contraction of the rectum, the patient suffers the symptoms which have been described, and also those attendant upon that kind of morbid degeneration, viz., lancinating pains, not constant but severe, an almost cartilaginous hardness of the rectum, which is felt if the finger be introduced to the diseased part, and frequently extends to the skin surrounding the anus; also, when the disease has advanced to the ulcerated stage, a fetid sanious discharge from the anus, together with involuntary evacuations of thin feculent matters. In females, a communication with the vagina is often established, and allows the contents of the bowel to escape by it. The appearance of the patient further characterizes the nature of the case, being thin and cachectic-looking, and exhibiting the greenish-yellow complexion usually observed in persons laboring under malignant disease.

In treating simple stricture of the rectum, if it should appear that the contraction depends on congenital malformation, which, it is important to know, sometimes escapes observation until an

advanced period of life, the best course is to divide the constriction freely with a knife, and afterward interpose dressing sufficient to prevent immediate closure of the wound or its subsequent contraction. But if the stricture be the result of diseased action in the coats of the gut, which has caused thickening and induration of them, the best remedy consists in the introduction of bougies successively increased in size, which, by inducing interstitial absorption in the parietes of the intestine, gradually restores them to a natural state. Bougies for this purpose are employed of various materials, such as steel, elastic gum, wood, and glass. The first two are the best. They should be slightly curved to facilitate their entrance into the rectum, and, if metallic, have a bulging extremity to render their passage through the stricture more distinctly perceptible. Before being used, they ought to be heated by immersion in warm water, and anointed with some unctuous substance. There is no advantage in allowing them to remain for any length of time after being introduced. They should therefore be immediately withdrawn, and ought not to be employed again before an interval of three or four days. Cancer of the rectum is no less incurable than in other situations, and, of course, could not be excised without inflicting a mortal wound, unless of small extent, and confined to the verge of the anus; all, therefore, that can be done for the patient in such unhappy circumstances, is soothing the irritation of the disease by opiate injections, the hip-bath, and gentle laxatives.

Fissures and Ulcers of the Rectum.

M. Boyer, in his System of Surgery, describes, under the title of Gerçure, or fissure of the anus, a very troublesome affection, which had previously been almost entirely overlooked. It consists, according to him, of one or more small superficial ulcerated chops, lying in the direction of the radiated folds of the anus, but rather more internally, so as not to be visible without a forcible separation of the nates. The distinctive symptoms of the disease are—pain in the region of the anus, aggravated during evacuation of the bowels, and such a close constriction of the sphincter as renders the introduction of a finger, or even a much smaller body, insufferably painful. It may occur at any

age, but is most frequently met with at and before the middle period of life, and in males much more frequently than females. The patient at first merely feels pain coming on some time after evacuation of the rectum, and suffers no further inconvenience in the intervals between these attacks, which may be of several hours' duration. As the disease advances, he experiences more severe and continued distress; pressure of any kind, as that which proceeds from sitting, occasions great uneasiness; and constipation is induced, which, by causing induration of the feculent matters, renders the symptoms still more intense. Mucus, sometimes tinged with blood, is copiously discharged; when the nates are separated, the anus appears to be absent, owing to the close contraction which it suffers from the inordinate action of the muscle; and if an attempt is made to introduce the finger, the patient involuntarily springs beyond the surgeon's reach. Any circumstances productive of local or general irritation tend to aggravate the patient's suffering; and those of an opposite kind occasionally procure for him intervals of comparative ease. The pain is especially referred to the situations which the chops occupy. The causes of the disease are not well ascertained.

For the cure of this complaint Boyer considered it necessary to divide the *Sphincter ani*, and such has been deemed the only certain means of remedy. Beginning my practice under this impression, I gradually limited the extent of incision, and since 1832 have felt warranted to state that, so far from division of the whole muscle being required, cutting the mucous membrane alone is sufficient. In short, the essential of the operation is, converting the fissure into an incision; and for this purpose, instead of the deep gash described by M. Boyer, I merely insert the point of a sharp-pointed curved bistoury at the lower end of the chop, and bring it out at the other extremity, so as to pass under the base and insure its complete division. The small wound thus inflicted scarcely requires any dressing, and the patient is at once relieved.

There is a form of this disease which frequently occurs, but is less easily recognized, though the symptoms are well marked, and the sufferings of the patient so great that its discovery is of no small consequence, especially as the remedy is equally simple and certain. This is an ulcer seated immediately within the sphinc-

ter, where, of course, it cannot be brought into view by the most forcible separation of the nates, and admits of detection only by examination with the finger, gently introduced and carried round the circumference of the gut so as to feel the condition of its surface. The ulcer has an elongated form, and rarely exceeds half an inch in length, not deep, but indurated at the margin, which facilitates its recognition. The patient's acute pain, when pressure is made on the ulcerated surface, also assists in the examination.

The symptoms of this ulcer of the rectum are similar to those attending fissures of the anus. There is the same pain *after* going to stool,—the same uneasiness in sitting, when the patient may be observed to rest with one hip on the corner of his chair,—and the same slimy discharge from the bowels. Uneasy feelings in the urinary organs are very generally complained of, especially a disagreeable sensation in the perineum, and frequent desire to make water, with more or less pain in doing so. I have met with instances of twenty or thirty years' misery from this source, aggravated by an endless variety of treatment, directed to the urethra by practitioners in this department of practice both at home and abroad.

When the presence of such an ulcer has been recognized, the patient may be relieved by the following no less simple than certain procedure. The operator having gently insinuated the point of his fore-finger, well-oiled, far enough to feel the exact situation and extent of the ulcerated surface, places the point of the sharp curved bistoury at the margin of the anus, and pushes it upward so as to pass under the base and issue into the gut above the summit of the ulcer, after which the incision is completed. It thus resembles that which has been described above for the remedy of *Fissures*, and requires the same treatment, or, rather, is equally independent of any.

Foreign Bodies in the Rectum.

Foreign bodies are introduced into the rectum either by descending through the intestinal canal, or by being forced through the anus. They are prevented from escaping by their size, or shape, or by both of these circumstances. Concretions of indi-

gestible matters, swallowed along with the food, or indurated masses of the ordinary feculent substance, may obstruct the gut. Fish-bones and other hard bodies of a spicular form, after passing through the whole length of the intestines, are sometimes detained by the *sphincter ani*. Pieces of wood, glass, earthenware, and other matters have been accidentally lodged in the rectum, by patients endeavoring to procure evacuation of their bowels, and still more rude articles have been forced into it in consequence of falls on the breech. The symptoms of course vary with the bulk and figure of the foreign body. If it merely obstructs the passage, the patient suffers only from constipation, together with more than usual uneasiness and sensation of weight in the region of the rectum; and if the coats of the gut are punctured or lacerated, the additional symptoms of bloody mucus, or blood discharged by stool, and pain more or less acute, will indicate the nature of the case. But the only method of acquiring certain information as to the state of matters is to make an examination with the finger, and this ought always to be done when there is any reason to suspect the existence of a local cause of irritation or obstruction in the rectum.

For effecting the removal of foreign bodies from the rectum, different means must be employed, according to the circumstances of the case. Feculent masses should be broken down with a scoop, or spoon, and extracted by the same means. Hard, pointed substances are best withdrawn by straight or slightly-curved forceps, guided with the finger, so as first to dislodge and then extract them. If they cannot be got out entire, another pair of forceps should be employed to break them into fragments, while the principal portion is held steady with those first introduced. When the difficulty proves extreme, it will be much better to make a free division of the integuments and sphincter, than subject the intestine to the risk of injury from violent efforts at extraction.

Hemorrhoids.

By Hemorrhoids, or Piles, are understood tumors of different kinds which are met with at the verge of the anus, either without or within the sphincter,—in the former of which cases they are said to be external, and in the latter internal. They sometimes depend

on a varicose condition of the hemorrhoidal veins, which form round, tense, dark-colored swellings,—but they more frequently consist of a morbid growth of the skin or mucous membrane, and subjacent cellular tissue. When external, they are of a round or flattened form, and, except when suffering from inflammation, possess the natural appearance and consistence of the part. When internal, they are very vascular, generally of a florid color, and uneven on the surface like a strawberry. External hemorrhoids occasion little inconvenience, unless irritated or inflamed, when they become much enlarged, round, tense, and extremely painful, especially if subjected to pressure. But those of the internal kind are productive of more continued distress, by protruding from slight exertions, bleeding at stool, or exciting sympathetic uneasiness in the urinary organs. These symptoms are not always equally severe, but, while hardly ever absent altogether, are apt to suffer occasional exacerbations, in consequence of general or local irritation. They exist sometimes together, sometimes separately, and one patient may complain merely of protrusion of the bowel, or bleeding from it, while another refers his sufferings entirely to the bladder. The disease is often not detected until an examination is made by the surgeon, and this therefore should always be done when the symptoms are at all suspicious.

The circumstances that chiefly tend to produce, and also aggravate, hemorrhoidal excrescences, are excitement of the digestive and generative organs, constipation, sedentary occupations, pregnancy, and exposure to cold or wet, which, by deranging the actions of the system, is apt to excite local inflammation, especially in parts having already a morbid disposition. It follows that the most effectual means of preventing the disease consist in using regular diet and exercise, avoiding excesses of every kind, and obviating constipation, if it should occur, by suitable medicine or regimen. Similar attention will palliate the symptoms; but during the paroxysms it is often necessary to maintain the horizontal posture, to facilitate the evacuation of the bowels by administering laxative doses of castor oil and emollient injections, and to allay the inflammatory condition of the parts affected by warm fomentations, the hip-bath, and leeches applied round the margin of the anus. Much relief is obtained, in the chronic state of the complaint, by the regular use of cold water

after evacuation of the bowels. But to effect a radical cure it is necessary to remove the excrescences, which may be done by the knife or ligature, accordingly as the disease is external or internal. In regard to external piles there can be no doubt that excision is the preferable mode, being much more speedy, and attended with less pain. It may be performed either with a knife or scissors, while the excrescence is held steady with a hook, forceps, or the finger and thumb. There is seldom bleeding of any consequence, and if a vessel should throw out a jet, it can be readily tied. The excision of hemorrhoids from within the sphincter, owing to the greater vascularity in this situation, and the difficulty of applying pressure or styptics to the cut surface, is attended with the danger of hemorrhage so profuse as to be very alarming, or even prove fatal, and is also apt to excite a no less dangerous inflammation. In such cases the ligature ought to be preferred, as it is perfectly safe, and has the advantage of so altering the structure of any portion of the excrescence that may have been permitted to remain as to prevent a relapse of the disease. When the patient, by straining at stool, has caused the whole mass of excrescences to protrude, the surgeon should tie them close to their roots with silk threads as tightly as he can. He may do this either by transfixing them at the base with a needle, and then including a half of each in one of the threads, or if they are small, seizing them with a hook or forceps and applying single ligatures. The everted gut and tumors should then be carefully replaced, and the patient should not quit the horizontal posture until the ligatures separate. If he suffers much irritation, which is seldom the case, he will derive most relief from doses of the muriate of morphia, repeated as often as may be necessary, and the hip-bath. Retention of urine is a frequent consequence of the operation, and may require the introduction of a catheter. In the piles depending upon a varicose state of the veins, relief may be afforded during the inflammatory paroxysm by puncturing the distended vessels and squeezing out their coagulated contents.

Polypus of the Rectum.

Vascular growths from the mucous lining of the rectum, having a rounded form and narrow elongated neck, so as to resemble a

cherry, are occasionally met with in the vicinity of the anus. They protrude at stool, and occasion various unpleasant feelings, besides sometimes giving rise to copious hemorrhage. They should be removed by ligatures, which may be applied either simply or by transfixion.

Prolapsus Ani.

Prolapsus Ani denotes a protrusion of the intestinal coats through the anus, so as to constitute an external tumor. The extent to which this occurs varies from the slightest eversion of the mucous membrane immediately within the sphincter, to the descent of the whole thickness of the gut for a considerable part of its length. Whatever portion is forced beyond the sphincter has its circulation impeded, and consequently becomes thickened and livid. When the mucous membrane alone is everted, it presents the appearance of a ring; but when there is prolapsus of all the coats, the tumor is globular, varying from the size of an egg to that of a child's head, and affords a copious secretion of bloody mucus, which very much resembles red currant jelly.

Prolapsus of the whole thickness of the gut, or what may be called complete prolapsus, occurs chiefly in children and aged persons, especially females of relaxed frame. That of the inner membrane, or partial prolapsus, is generally observed in the vigor of life. The exciting causes of the former are, in children, severe or long-continued straining at stool; and in adults, generally, violent exertions, as in lifting weights on the back. Some local irritation, as that of ascarides in the rectum, or stone in the bladder, is often concerned in producing the disease in young persons, especially when it attains a great extent. The partial prolapsus, which is usually met with in adults, depends upon the presence of hemorrhoids.

An attentive consideration of the circumstances which have just been mentioned will indicate the preventive and remedial measures that promise to be most beneficial. In treating the complete prolapsus of children, it is necessary, in the first place, to remove any local source of irritation that may be discovered to exist; and, should there not appear to be some such exciting cause, the patient must be prevented from straining long or violently at stool, by having his bowels kept in an easy state, and by being

placed on an elevated seat, which will not permit his feet to touch the ground, and consequently render it difficult for him to bend his body forward, which makes the pressure of the diaphragm act more directly on the contents of the pelvis. The partial protrusion that occurs in adults requires for its remedy the removal of hemorrhoidal excrescences, whether external or internal,—the prevention of constipation by suitable regimen and medicine,—and the use of injections thrown into the rectum. When there is much relaxation, and consequent tendency to prolapsus, it will be observed that the integuments round the margin of the anus, when the gut has been replaced, are not tense and smooth, but loose, and thrown into radiating folds. M. Dupuytren proposed to cut away some of these folds, and, by thus diminishing the extent of the redundant skin, while consolidation of the remainder was induced by the adhesive process following the inflammation excited by the operation, radically cure the disease. Mr. Hey, of Leeds, with a similar view, removed the whole of the loose skin. This excision is easily performed, and generally proves effectual. Sometimes the ring of the prolapsed membrane, from inflaming, becomes permanently protruded, and the patient, who suffers constant pain, can neither walk nor stand. In these circumstances, the whole of the protrusion may be removed by ligature with perfect safety and complete relief, immediate as well as permanent. The disease is best treated, however, when in its ordinary state and free from inflammation. It is then easy to ascertain the exact extent of hemorrhoidal swelling concerned, and employ the requisite measures. In every case, the whole of the internal piles should be removed by ligatures, and after they have been tied, any of the external kind that appear are to be carefully cut away, together with the loose redundant integument surrounding the orifice of the gut. In all operations at this part, it should be a rule never to leave any hemorrhoidal growth, either external or internal, since the portion permitted to remain will be almost sure to inflame and prove troublesome.

The tumor that is formed by prolapsus of the whole thickness of the intestine, whether occurring in children or adults, is in general very readily reduced by slight pressure, provided the expulsive efforts have ceased and the patient assumes the horizontal posture. Occasionally, however, from the parts being allowed to

remain for hours, or even days, protruded, the intestinal coats become greatly thickened, consequently increasing the size of the swelling, and rendering replacement of the gut more difficult. A manipulation, similar to that of the taxis, must then be carefully employed, after the surface of the tumor has been lubricated with oil. The neck, or part next the anus, is steadily compressed with the fingers, and then pushed upward through the ring which is formed by the sphincter. Successive portions are to be returned in the same way, until the remaining portion is so small as to admit of being pushed up at once.

Fistula in Ano.

Abscesses frequently form in the neighborhood of the anus, and, when evacuation is allowed to take place naturally by ulcerative absorption, the opening is generally external; but sometimes it is formed through the gut, and not unfrequently there is both an external and internal aperture, the formation of the latter being usually secondary to that of the former. After the matter is discharged, the cavity of the abscess very rarely heals spontaneously, but remains contracted in its capacity and thickened in its parietes, constituting a sinus, which is named *Fistula in Ano*. The fistula is said to be Blind External, Blind Internal, or Complete, accordingly as it has merely an external or internal opening, or both the one and the other. The external orifice is variously situated, but generally exists at one side, and is seldom either before or behind the anus. It is usually small, and surrounded by an elevated induration more or less distinct. The internal opening was formerly thought equally variable in respect to its distance from the anus, and was searched for at the highest part to which the sinus reached. M. Ribes (1820) ascertained the important fact that, if existing at all, it is almost invariably seated about an inch or little more from the anus, and can hence be brought nearly or altogether into view by forcibly separating the nates. It is generally small, and often extremely so, with difficulty permitting a probe to pass.

The symptoms of the primary abscess are pain, hardness, and slight diffused swelling in the neighborhood of the anus, from which relief is obtained upon a discharge of matter taking place

externally, or from the gut. There is great variety in the degree of acuteness, and in the progress of the disease, the pain being sometimes very severe, and at others hardly perceptible, while evacuation may be accomplished in the course of a week, or not until the expiration of months. The remaining sinus affords a thin discharge, which is sometimes very copious, and at others so scanty that the patient might suppose he had got quite well, were it not for a slight staining of the linen and an uneasy sensation felt now and then in the parts affected. The unceasing action of the sphincter, which tends to separate the sides of the sinus, and the passage of liquid or gaseous matters from the intestine through it, not only prevent the cavity from closing, but render its parietes thick and callous from the interstitial effusion of lymph, which is induced by the continued irritation thus occasioned.

The causes of abscess in this situation are chiefly the inflammation of hemorrhoids, remaining long in a sitting posture, constitutional disturbance, and local irritation from foreign bodies arrested in the rectum. Males are more subject to the disease than females, who comparatively rarely suffer from it. It occurs most frequently during the vigor of life, between twenty and fifty years of age, and is very often met with in phthisical persons, whether owing to the irritation that is occasioned by the morbid state of the lungs, or dependent on the ulceration of the intestines, which generally exists in such cases, it is difficult to decide. Children, and even infants, are not exempt from it.

In treating the inflammation which precedes the abscess, bleeding from the part is never found to be productive of any advantage, and, on the contrary, seems to have an injurious effect in rendering the morbid process more slow and unmanageable. Warm fomentations, gentle laxatives, and emollient injections afford most relief, and if they do not succeed in resolving the inflammatory action, hasten its termination in suppuration. When fluctuation can be distinctly perceived, a free opening should be made with the knife to prevent extension of the matter in the cellular substance, after which a poultice may be applied for a few days, and then simple dressing. Various methods have been followed in treating the subsequent sinuses or fistulas. Injections and ointments of every sort have been

introduced into them, but seldom if ever with any permanent advantage; and it is now admitted that, except through means of the knife, a cure is next to impracticable. Incisions were formerly practiced with another view, which was to remove the callous walls of the cavity, from the erroneous idea that they depended upon a peculiar morbid action instead of being simply the result of continued irritation. The practice founded on this mistaken principle was no less unsatisfactory than severe, as the recovery after operation always required a long time, and often proved incomplete. Simple division of the septum between the sinus and gut, which is the practice now employed, has been performed in a manner much more painful, difficult, and uncertain than was necessary. This arose from its being thought requisite to cut the gut as high up as the sinus extended, and to dress the wound with irritating applications, in order to promote the removal of its callous edges and surface. It is now known that the induration depends entirely upon the irritation of the sinus; also, that the internal opening is always very near the orifice of the gut; and that it is sufficient to divide the part of the septum which lies between the external and internal openings; lastly, that unless the internal opening be comprehended in the incision, the division of the septum, however free, will fail in affording a permanent cure. It may be added, that where an internal opening does not exist, a remarkable thinness of the septum, which seems here to consist merely of the mucous membrane, is always observed at the place where the aperture is usually situated, and in such cases it is found sufficient to cut thus far. The operation which is now performed for *fistula in ano* being established on these principles, is extremely simple and easy, and is not attended with either much pain or any risk of bleeding. It does not require the complicated instruments formerly employed, and is readily effected by a blunt-pointed curved bistoury. The patient should be placed with his body bent forward, and his arms leant on a table or the back of a chair, unless the fistula is on the left side of the anus and the surgeon cannot use the bistoury with his left hand, in which case the patient must be laid on his back with the thighs drawn up. The surgeon introduces his fore-finger into the gut, and then searches with a probe in the fistula for its internal opening, or, if there is none, for the thin denuded mem-

brane where it would be, if present. Having withdrawn the probe, he insinuates the bistoury, carefully conveys its point through the internal opening, or, if none exists, pushes it through the septum, and then, resting the back of the blade upon his finger, brings the point of the knife out at the anus, after which the septum may be divided quickly and easily. In difficult cases it is better to let the probe remain, and cut it out while still passed through the internal opening. Any sinuses running into the hip or perineum ought next to be laid open. Pieces of lint should be placed between the cut edges, and renewed for a few days until granulation is established, when superficial dressings are sufficient. In cases of blind internal fistula, which are rare, it would be found very difficult to comply with the directions generally given, to guide a probe up the gut into the sinus and make its point protrude in the hip, to show where the knife should be introduced to make the fistula complete. Such a process is fortunately quite unnecessary, as the seat of the sinus can always be readily recognized by its softness compared with the firmness of the surrounding parts, especially those in the immediate neighborhood, which constitute the walls of the cavity and are indurated by the effusion of lymph. At the center of this part, which is felt most soft and yielding, an incision should be made, and then the operation may be completed, as if there had been an external opening in the first instance.

Fistula in ano, depending upon caries of the sacrum, or connected with phthisis, is of course incurable; but partial relief may often be afforded by giving the matter free vent for its discharge. It may be observed that when the obstinacy of the fistula depends on other causes besides those of a local kind, and particularly the one last mentioned, the external orifice is generally large, and surrounded with thin flabby integuments.

Retention of Urine.

1. Retention from Deficiency in the Expulsive Power of the Bladder.

The urinary bladder may be weakened in various ways, so as to effect the evacuation of its contents imperfectly, or not at all.

Mere inordinate and long-continued distention, by overstretching the muscular fibers, destroys, more or less completely and permanently, the contractility of the organ, and in a corresponding degree renders the patient unable to void his urine. When the retention is complete, the bladder is distended until it contains several pounds, and forms a large tumor, which may be seen and felt in the hypogastric region. The ureters and pelvis of the kidneys then become distended, after which the secretion of urine being opposed by the pressure of that already accumulated, the patient's state remains without much alteration, until evacuation is effected artificially or takes place through ulcerative absorption of the coats of the bladder. In this state the patient suffers inexpressible distress from a constant desire to empty his bladder, and from the incessant efforts, violent but abortive, which it induces him to make. Small quantities of water dribble away by drops from time to time, as the secretion slowly proceeds, but the tumor suffers no diminution of size or tension. Exposure to cold or wet, and injuries of the spine, give rise to the same powerless condition of the bladder; and if there be any mechanical obstacle to excretion previously existing, as from stricture of the urethra, swelling of the prostate gland, or tumors pressing on the canal, or if the expulsive power of the bladder be weaker than usual, this effect is still more readily produced. In old age the bladder is apt to lose its tone and expel the urine imperfectly. The patient observes that he makes water more frequently than before,—that he does so in smaller quantity at one time,—that the stream is not forcible, but small and dribbling,—and that he passes more or less of it during his sleep. It is the last symptom which generally first attracts notice and leads to the more careful attention that detects the others. The obvious explanation of it is, that the bladder never being fully emptied, but merely having the excess expelled, which its feeble power, aided by the compression of the abdominal muscles, is able to command, and becoming distended beyond this extent during sleep, while the resistance of the voluntary muscles at the neck and membranous part of the urethra is no longer opposed to its evacuation, the water flows away gently without awakening the patient.

The treatment of this palsied state of the bladder, whatever be its cause or degree, absolutely requires, in the first place, that

the water should be drawn off, since it is only by being allowed to contract that the muscular fibers can recover their usual power. This is effected by introducing a catheter, which may be either flexible or rigid,—the former being made of elastic gum and the latter of silver. Unless there is reason to suspect some morbid alteration in the width or direction of the urethra,—the mode of discovering and treating which will be explained hereafter,—an instrument should be selected equal in size to the ordinary width of the canal. Different surgeons prefer different curvatures of the catheter; but it may be observed in general that it is passed most readily when the bent part is short. The patient should be laid reclining, or made to stand erect with his back supported. The surgeon, holding the penis between the thumb and fingers of his left hand, introduces the point of the catheter, lubricated with oil, into the urethra, and pushes it gently onward, at the same time stretching the penis until it reaches the bulb. He then relinquishes his hold of the penis with the left hand, applies the points of its fingers to the perineum at the verge of the anus, and bringing the catheter into the direction of the mesial plane, withdraws the handle from the abdomen, so as to make the point ascend, from the dilatation at the bulb, into the more narrow membranous part of the canal. By simply continuing to depress the handle, and supporting the perineum, or introducing his forefinger into the rectum so as to elevate the point more effectually, he conveys the catheter fairly into the bladder. A surgeon who is practiced in the operation will find it more convenient, when the patient is standing, to introduce the catheter as far as the bulb with the convexity upward or toward the pubis; and then, by making the handle describe a semicircle, turn it into the same position as when passed thus far the other way. The subsequent part of the process should be conducted in the manner which has been already explained. The danger to be dreaded in performing this operation consists in forcing the point of the catheter through the lining membrane of the urethra into the spongy texture which surrounds it. The false passages thus made occur most frequently about four inches from the orifice, owing to the handle of the catheter being too soon depressed;—at the bulb, from its not being depressed sufficiently, whence the point is pushed between the membranous part of the urethra and the rectum;—and just

before entering the neck of the bladder, from the point not being sufficiently elevated while urged forward, which forces it into the substance of the prostate gland. Attention to these sources of error will guard the surgeon against making false passages, and enable him to avoid them if already formed.

It seldom happens that one evacuation of the bladder is sufficient for the patient's recovery. He feels completely relieved at the time, but soon begins to suffer again from the symptoms of distention; as the bladder, even when in the soundest state previously, is slow in regaining its contractile power. The catheter, therefore, must be introduced once or twice a day, until it ceases to be required. If the cure should never be completed, as in cases where the palsy arising from distention is complicated with the weakness of old age, it will be requisite to draw off the water regularly, especially at bedtime, to prevent its involuntary discharge during sleep.

2. Retention of Urine from Irritation and Spasmodic Contraction at the Neck of the Bladder.

When the ordinary resistance to the passage of the urine is increased by inordinate contraction of the muscles, which in the healthy state oppose the expulsive power of the bladder, the fluid is retained, and gives rise to the same symptoms as in the former case, but generally in a very acute form. The muscles concerned in producing this effect are the sphincter of the bladder, and Wilson's muscles, which descend from the pubis and embrace the membranous part of the urethra. The causes which excite their excessive action are irritations, sometimes indirectly applied, as those proceeding from exposure to cold, the use of stimulating food or drink, or the employment of cantharides; but more frequently of a local kind, as from inflammation of the extremity of the urethra, spreading back toward the bladder, or from the injurious effects of instruments introduced into the canal. If these circumstances operate on a person whose urethra is previously diseased, and more especially if it should be already contracted from any cause, the retention of urine will of course be more readily and completely induced. From the nature of the exciting circumstances it may be inferred that, along with the muscular

constriction, there is a thickening of the mucous membrane, depending on vascular engorgement, which contributes to the effect, and must be kept in view during the treatment.

As the disease depends on irritation, soothing measures ought always to be employed in the first instance. Mild and anodyne injections thrown into the rectum, the hip-bath, and venesection if the pulse should require it, often prove sufficient to afford relief. Should they fail in doing so, and the symptoms are urgent, it will be necessary to draw off the water by the catheter, since the additional irritation thus occasioned is more than counterbalanced by the good effect of emptying the bladder, which, when stimulated by distention, reacts upon the spasmodically contracted muscles at its neck and increases their resistance. The instrument used on this occasion should be neither full-sized—as the urethra is not only compressed by the muscles, but also swollen and contracted—nor very small, as the excited and congested membrane is softer, and, consequently, more easily torn than usual. It should be passed very gently, and with great care, to avoid the erroneous directions of its point, which have been mentioned above, and in this case are extremely apt to occasion breaches, that increase the difficulty of the operation by exciting still more irritation, by causing hemorrhage, and by misleading the surgeon in his future attempts. The relief afforded by evacuation is seldom permanent, the irritated state of the organs giving rise to a deceitful feeling of distention, and rendering the patient very soon desirous of having the catheter again introduced. To obviate these uneasy symptoms, an opiate injection ought to be thrown into the rectum immediately after the instrument is withdrawn; and the operation ought not to be repeated oftener than there may be reason to suppose that the urine has accumulated to an injurious extent. To counteract the constipating effect of the opium injection, and remove any source of irritation from the intestinal canal, a tablespoonful of castor oil should be given every day or two, according to circumstances. The food of the patient should be of the least stimulating kind; and he should drink freely of mucilaginous diluent fluids, such as barley-water containing small quantities of carbonate of soda,—nitrous ether,—or camphor mixture. Bodily fatigue and exposure to cold must be strictly avoided.

Stricture of the Urethra.

Strictures of the urethra were formerly attributed to fleshy excrescences obstructing the canal, and spasmodic contraction of the fibers lying in the substance or on the external surface of the urethra. It is now almost universally admitted that they invariably depend upon narrowing and thickening of the lining coat, from lymph being effused and organized in its interstices. There is thus produced a constriction, varying in tightness from the slightest perceptible diminution of capacity to almost complete closure,—and in extent, from the breadth of a thread to the length of an inch or more. In some very rare cases the stricture has been found on dissection to exhibit what is called a bridle form, there being a fibrous band stretched across from one side of the canal to the other, in consequence, no doubt, of lymph having been effused into the interior of the canal and organized there. The most common seat of stricture is anterior to the bulb, about five inches from the orifice. The one next in frequency is between two and three inches from the orifice. The other situations particularly exposed to its occurrence are the neck of the glans and orifice of the urethra. Two or more strictures are often met with in the same urethra, but when this is the case, one of them in general proves the most confirmed of the whole. The cause of strictures can seldom be positively ascertained, except in cases of injury from external violence. There is no doubt that a very large proportion of them occur subsequently to gonorrhœa, but whether this be in consequence of the disease, or the means employed to remedy it, admits of question. It may be safely stated, that inflammation, or at all events excitement of the urethra, precedes the process which establishes the thickening and induration, and whatever tends to produce this condition of the membrane will expose to the risk of stricture. Severe gonorrhœas, in which the inflammation spreads back along the urethra,—irritating injections, allowed to enter the passage too far,—frequent indulgence in venery,—stone in the bladder or other parts of the urinary organs,—and habitual addiction to a diet that stimulates the parts concerned, may thus be regarded as causes of stricture.

Besides this true organic stricture, the urethra is liable to a

temporary constriction, which has usually been attributed to spasmodic contraction of the surrounding muscles, although congestion of the vessels may probably have a considerable share in producing the effect. Independently of the perineal muscles, however, there can be no doubt that the urethra, both in health and disease, possesses a contractile power which, under the influence of irritating circumstances, may prove excessive, so as either to produce the symptoms of stricture or to aggravate those proceeding from a permanent constriction.

The symptoms of stricture are: 1. Difficulty in making water, owing to the resistance which is opposed to its escape by the narrow part or parts of the canal. The bladder, therefore, is slowly emptied; and its muscular coat becomes greatly thickened, so as to present an appearance similar to that of the ventricles of the heart on their inner surface. 2. Small size of the stream, which is usually spiral, forked, or dribbling. 3. Pain, generally experienced during micturition, and seldom afterward. 4. Frequent desire to evacuate the urine, which is most remarkable during the night, from the circumstance of persons in health not requiring to do so between the time of lying down and getting up. The patient also often complains of pain *in coitu*,—of a thin gleety discharge from the urethra,—of swelling and pain of one or both testicles,—of uneasiness about the loins and limbs, and of muscular weakness of the latter. He frequently suffers feverish attacks of short duration, but considerable intensity, resembling in all respects the fits of an ague. It is observed that the severity of all these symptoms increases when the patient is subjected to irritation, whether general or local, and diminishes in opposite circumstances.

A very distressing and not unfrequent consequence of stricture in the urethra is abscess, followed by fistula of the perineum. The canal is always much dilated behind the contracted part, and sometimes suffers perforation from ulcerative absorption, so as to allow the urine to enter the cellular substance. But instead of being formed by this process, the abscess is much more frequently called into existence merely by the irritation resulting from the stricture, which excites inflammation and suppuration in the cellular substance, or glands adjacent. In either case the result is the same; and a sinus is formed, leading from the urethra, gener-

ally the membranous part of it, to the surface of the perineum. The urine, in a larger or smaller proportion, passes through this preternatural canal, the parietes of which, owing to the continued irritation thus produced, become thick and hardened, so as to resemble cartilage. The urethra becomes more and more contracted,—new abscesses are formed,—the number of sinuses is increased,—and at length the whole perineum is perforated with openings, which discharge pus mixed with urine, and the seminal fluid also if it happens to be ejected; while all the neighboring parts are not only thickened and indurated, but almost constantly inflamed, and engaged in the formation of abscesses.

The treatment of stricture, until lately, has been conducted chiefly through means of Caustic, Internal incision, and Dilatation. Caustic has had the support of many powerful advocates. Wiseman proposed it so long ago as in his day, under the supposition that the disease depended on the growth of fleshy excrescences from the inner surface of the urethra. John Hunter recommended it for destroying the callous contracted state of the canal, which he more correctly regarded as the cause of obstruction. Sir E. Home, Lallemand, and other surgeons of recent times have earnestly supported it by their practice and writings. But from having been generally employed, it has now, in this country at least, fallen almost entirely out of use, which is not surprising when its disadvantages are considered. The mode of application usually practiced was to insert a bit of lunar caustic, or potass, into the extremity of a wax bougie, and fix it in its place by pressing down the edges of the excavation made for its reception. The bougie was then passed quickly down to the stricture, the seat of which had been previously ascertained, and allowed to remain pressed against the obstruction for a few seconds, so as to let the escharotic effect be produced. The operation being repeated as frequently as the irritation induced by it permitted, at length enabled a full-sized instrument to pass. It may be readily imagined that the process of cure thus conducted was necessarily very tedious, painful, and dangerous. The successive applications of the caustic required intervals of several days, and the cure was seldom completed without very many operations of this kind; sometimes a hundred or more. The irritation produced by the caustic not only excited excessive pain, but

subjected the patient to the risk of complete retention of urine, swelled testicle, and other bad consequences; and if the caustic happened to drop out of the bougie, violent inflammation, with various injurious effects on the neighboring parts, abscess of the perineum, etc., were apt to be induced. Modern improvements in the apparatus for applying the caustic have in some measure obviated these objections. Instead of being carried down to the stricture by the simple but insecure means above mentioned, it has been introduced into the strictured portion of the canal more accurately, safely, and efficiently, by various instruments, constructed on the following principle: A catheter, straight or curved, of full size, has a small perforation in its round extremity, to which a wire is fitted, so that when pressed at the handle of the instrument it may be caused to project. This wire has a slit a little way from the point for receiving the caustic, and when thrust out at the opening of the catheter, after it has been pushed down to the seat of the stricture, will, if successfully managed, apply the escharotic substance to the surface of the morbidly contracted part of the canal. But although the application may thus be rendered more secure from harm, its beneficial effects are still in the highest degree unsatisfactory.

Division of the stricture by internal incision has been proposed and practiced at various times, by introducing a canula with inclosed lancet-blade, which may be protruded after the sheath has been conveyed down to the stricture. Mr. Stafford advocated this operation, and improved it by the invention of ingenious instruments for its performance; but the objections which have been alleged to the caustic apply still more strongly to such a mode of treatment, since it can never be safe, even in the hands of the most expert operator, and has proved to be productive at the best of only temporary benefit. A French surgeon named Reybard has modified this process by using instruments of an enormous size, the canula being equal to a bougie of the full magnitude, and containing a blade large enough to cut through not only the urethra but also the *corpus spongiosum*. The disastrous effects of such a preposterous engine are fortunately prevented by the obvious impracticability of its employment for the remedy of *stricture*. Another mode of incision has been long practiced for contractions deemed impracticable. This was named Boutonnière, or

the button-hole operation, and consisted in passing a bougie or catheter down to the obstruction, and cutting beyond its point so as to open the distended canal. It was extremely embarrassing in the execution, very dangerous from the risk of hemorrhage and extravasation of urine, and hardly productive of more than temporary relief.

Dilatation has been long employed to remove strictures of the urethra, and even before it was known to be the cause of amendment. When fleshy excrescences were regarded as the source of obstruction, bougies, armed with caustic, or medicated, as it was termed, with various ingredients believed to have the power of promoting absorption, were introduced into the passage. The caustic, no doubt, produced its peculiar effects, but the other materials were found at length to be quite useless; and it became apparent that the good effects which attended their employment depended entirely upon the mechanical pressure of the instrument. Though the direct effect of a bougie is merely mechanical, the removal of the stricture depends on a vital process which is thus excited, and not on simple stretching. The pressure excites interstitial absorption of the thickened walls of the canal, and hence it is that when an instrument of a certain size has been passed with difficulty, a larger one can often be readily introduced by a subsequent attempt a few days afterward. Such being the mode in which benefit is derived from the use of simple bougies in the treatment of stricture, it is evident that they must be employed so as to produce merely such a degree of irritation as is sufficient for giving rise to absorption, since more than this might be apt to occasion interstitial effusion instead of absorption, and aggravate the stricture instead of relieving it. The bougies, therefore, should not be introduced too frequently, or too forcibly, or for too long a time; and their use should not be persisted in when the parts or system are particularly irritable. Metallic bougies are best calculated for the purpose, being the most smooth and easily guided. They may be made solid of steel and hollow of silver, or of the compound metal named Berlin silver, which I have found to answer very well for the purpose, being sufficiently rigid, taking a fine polish, and not being liable to rust. They should be gently passed down to the obstructed part, in a series of gradually decreasing sizes, until one can be introduced into the

bladder, after which it ought to be immediately withdrawn. In the course of two or three days, when all the irritation that has thus been excited seems to have subsided, the same instrument may again be introduced; and after it is withdrawn, another of somewhat larger size. By proceeding in this way, the cure, in moderately favorable circumstances, may be completed within from three to six weeks. The grand error to be avoided is that of proceeding too hastily, which not only defeats the practitioner in attaining the object he has in view, but exposes the patient to the danger of hemorrhage, complete retention of urine, swelled testicle, feverish attacks resembling ague, and other unpleasant consequences. The urethra should always be dilated to its full size, as a relapse is otherwise apt to happen; but any further extension than this can do no good.

There are two forms of stricture in which the bougie has been found inadequate to afford relief. In one of these the canal, especially at the seat of contraction, is so extremely irritable that even the most gentle use of instruments gives rise to violent and dangerous disturbance of the system, with rigors followed by fever, and frequently local inflammation. The patient, exhausted by such efforts, dreads their repetition; and successive practitioners, finding that their most careful efforts lead only to the same results, any further attempts to afford relief are at length deemed inexpedient, and the disease is allowed to pursue its course, until a fatal retention of urine, or some equally fatal operation, undertaken to prevent extravasation, terminates the complicated sufferings of such a case. In the other form of stricture which resists the ordinary means of treatment, there is an extreme degree of resiliency, and tendency to contract after dilatation, so that only the most evanescent relief can be obtained through the means employed for this purpose. It may be added, that in both of these obstinate forms the symptoms of the disease are, in general, peculiarly distressing, the urine being not only expelled with great difficulty by drops, or the smallest of thread-like streams, but also very imperfectly retained, dribbling away involuntarily by day as well as night, and causing the utmost discomfort, by its effects on the patient's clothes and skin exposed to the acrid moisture.

In 1844, I felt great pleasure in communicating to the pro-

fession a mode of remedy which had afforded complete and permanent relief in a case of obstinate stricture, than which it was impossible to imagine one more distressing or more hopeless, under any other known means of treatment. In 1849, encouraged by further experience, I published a treatise on the treatment of stricture, with the view of explaining and recommending this method, and since that time have related a great many additional cases illustrative of its effects. For more particular details I may refer to these sources of information, it being sufficient at present to render the principles of practice distinctly intelligible.

It is well known that there are certain textures, healthy as well as morbid, which cannot be expanded without pain and the risk of inflammation, but may be divided by incision with ease and safety. Spasmodic stricture of the anus, and the ring at the base of the prostate, which cannot be torn without the production of fatal effects, afford examples of this kind, and illustrate the advantage of cutting, under certain circumstances, instead of dilatation. In strictures of the urethra which exhibit the irritable and unyielding or resilient characters, it therefore seems reasonable to expect advantage from dividing them freely by means of a cutting instrument, instead of persevering in vain and hazardous efforts to dilate the contracted part by bougies. Attempts to accomplish this, by introducing sheathed blades into the canal, and also by cutting from without upon the point of an instrument carried down to the seat of obstruction, had been frequently made with a different view, viz., overcoming resistance, which was supposed to render the canal impermeable, but with very unsatisfactory results, from imperfect attainment of the object, extravasation of urine, and hemorrhage caused through the want of a safe guide for the knife. In the operation which I proposed, the first and essential step was to introduce a grooved director fairly through the stricture, so that complete division of the whole thickened texture might be effected with certainty, and with security from any lateral aberration, endangering the artery of the bulb or other arterial branches, the mesial plane of the perineum, which corresponds with the raphe, being free from vessels of the slightest consequence.

But if stricture were frequently impermeable, this method must have been limited in its employment, and incapable of afford-

ing relief in those cases which chiefly required it; and, therefore, so long back as 1844, I expressed my persuasion that no stricture was truly impermeable, the exit of water being a certain sign that instruments might, through sufficient care, be introduced. This principle of practice was obviously of great importance, since conviction of its truth would obviously lead to much more prolonged and careful exploration of the passage than would be thought requisite, if belief in the existence of impermeability were entertained. For my own part, it was frankly confessed that, while sharing in the doctrine of impervious urethras, I had occasionally found them so, and performed the old operation, while ever since adopting the principle that every stricture might be permeated by instruments through time and care, I had not, either in public or private practice, met with one that proved incorrigibly obstinate.

In performing the operation, the only instruments required are a short, straight, sharp-pointed bistoury, a grooved director, and a silver catheter. The patient, under the influence of chloroform if he pleases, being placed with his back upon a bed or table, and his limbs held up so as to expose the perineum conveniently for the purpose in view, the operator introduces the director, confides it to an assistant, and makes an incision over the stricture about an inch and a quarter in length, exactly in the central line or raphe. This incision should at once extend through the skin, subjacent cellular texture, and fascia, and be afterward deepened if necessary, great care being taken to cut precisely in the same plane, and especially to avoid going aside beyond the director. The operator, having felt the instrument distinctly, takes it in his left hand, and guarding the knife on his right fore-finger, inserts its point into the groove, on the bladder side of the stricture. He then urges the blade through the thickened and indurated urethra, which, from its toughness and yielding disposition, is apt to elude the knife, and next, having withdrawn the director, passes the catheter into the bladder, where it must be secured by proper tapes and a bandage round the loins. The catheter may be removed on the fourth day.

This operation, when properly performed, I believe to be perfectly safe, but is apt to produce serious effects through inattention to some apparently trivial circumstance. Thus, if the catheter

be allowed to escape from the bladder, and urine is allowed to separate the recently united edges of the wound, violent constitutional disturbance is almost sure to follow.

Another mode of treatment, though I fear inadequate to subdue this disease in its most obdurate form, may be employed on ordinary occasions, with the effect of accomplishing success more quickly than through gradual dilatation. This is to rupture the condensed part by separating the branches of a suitable instrument introduced into the bladder. Ingenious instruments for this purpose have been invented at different times, and of late by Mr. Holt, who has strongly advocated this course of treatment.

When the disease is complicated with *fistula in perineo*, the same treatment proves sufficient, as the sinuses, together with the callosities or induration surrounding them, speedily disappear after the obstruction which gave rise to them is removed. The incisions, excisions, and cauterizations which were formerly practiced are therefore both unnecessary and improper. But if the stricture require division on its own account, the presence of a fistulous condition will of course afford no objection to this procedure. If the urethra is altogether obstructed anterior to the fistula, so that even the smallest instrument cannot be passed through it, the only remedy is to introduce a catheter as far as the canal permits, and then cut down upon its extremity from the fistula, so as to allow its passage into the bladder. A flexible catheter should then be introduced, and allowed to remain for three or four days, to prevent the recent solution of continuity from healing by primary union; but it ought not to be left longer than this, as its presence would occasion a degree of irritation unfavorable to the cure by granulating contraction. If the instrument is introduced occasionally, with the interval of a day or two, it will prevent any chance of the canal becoming again obstructed, and not interfere with the process of reparation.

Retention of Urine from Blows on the Perineum.

Blows on the perineum are apt to occasion difficulty or total obstruction of the urinary evacuation. In some cases there is no solution of continuity effected by the violence, no wound of the integuments, or rupture of the parts within, but merely as it

seems a temporary paralysis, or want of consent in the muscles concerned, in consequence of the contusion. At other times the urethra is torn, blood streams from the orifice of the penis, not a drop of urine can escape, and a tumor is formed under the integuments of the perineum, opposite the injured part, by blood and urine.

The treatment of such injuries is obvious, and not difficult. If there is no evidence of the urethra being ruptured, it may be expected that rest, warm fomentations, and slightly stimulating injections thrown into the rectum will soon restore the healthy actions which have been disturbed; and should circumstances require it, a catheter may be introduced with the same facility as usual, to relieve the bladder from distention. For some time after such injuries a bougie should be passed occasionally, to prevent contraction of the canal, which is apt to happen in consequence of the irritation caused by the blow. But if, from the discharge of blood, the tension of the perineum, and the impossibility which is experienced in attempting to introduce a catheter, it is ascertained that the urethra has been ruptured, means must be taken without delay to provide for the evacuation of the urine, which cannot be expected to take place naturally, and to prevent the fluid from passing extensively into the cellular substance through the breach of the urethra, which would necessarily lead to the most disastrous consequences. The best mode of proceeding is to cut into the perineal tumor, and then, having brought the ruptured canal into view, to convey a flexible catheter into the bladder. It may be allowed to remain for a few days, as in the case of operating for obstructed urethra, and the subsequent treatment does not differ from that which is proper on such an occasion.

Diseases of the Prostate Gland.

The Prostate Gland is little subject to disease previous to the age of fifty-five or sixty. It is then liable to an enlargement, which in its nature most agrees with the simple vascular sarcoma, and, though often named scirrhus, has none of the characters of carcinomatous formations except an approach to their hardness. The tumor is dense and fibrous, possesses little sensibility, is not disposed to any morbid action except its own nutrition, and,

though the cause of uneasiness by its pressure on the neighboring parts, is hardly ever itself the seat of much pain. The gland seldom enlarges equally, generally exceeding in one of the lateral lobes, and not unfrequently sending a round process upward, encroaching on the cavity of the bladder, immediately behind its neck. Sir E. Home accounted for this marked limitation of the growth to one part of the gland by attributing it to the existence of a distinct *middle* lobe of the prostate; but in a healthy state of the part it is difficult to discern any trace of such a structure. Whatever be the true explanation of the fact, it is an important one in several points of view. Enlargement of the prostate, whether partial or general, does not necessarily or usually diminish the width of the urethra, but alters the direction of the canal so as to impede more or less the passage of the urine. When the whole gland swells, the neck of the bladder is of course elevated in a proportional degree, and the course of the urethra consequently rendered not only longer but more curved than natural. If one of the lateral lobes is more enlarged than the other, it gives the canal a bend to one side, and if the tumor is confined to the upper surface of the gland, within the orifice of the bladder, though the urethra cannot suffer any change, the excretion of urine may be considerably impeded.

The symptoms of enlarged prostate are—1. A feeling of weight and uneasiness in the lower part of the pelvis; 2. Pain and difficulty in evacuating the bowels; 3. Frequent and slow micturition; 4. A copious discharge of mucus with the urine, at the bottom of which it remains separate, forming a glairy mass that adheres to the vessel when the water is poured out; 5. A fetid ammoniacal smell of the urine. These symptoms, though in general always distinguishable, are seldom very well marked, except when the urinary organs suffer irritation from a local or constitutional cause. They then become greatly aggravated, and constitute what is called a fit of the disease, during which the patient has an almost incessant desire to empty his bladder, experiences extreme pain in attempting to do so, and sometimes labors under a complete retention of urine. Considerable information may usually be obtained as to the existence and degree of the enlargement, by examining the gland with the finger in the rectum after a catheter or bougie has been introduced into the bladder. Unless this pre-

caution be taken, the prostate is very apt to be thought enlarged when it is not altered in size.

The cause of the disease, as might be expected, seems to be excitement of the gland, either directly or through sympathy with the neighboring parts; and it is accordingly observed chiefly in those who indulge in venereal excesses, who use a luxurious diet, or who are exposed to the stimulating influence of a warm climate. It occurs much more frequently in persons whose circumstances expose them to the evils of sedentary habits and redundant nourishment than in the laboring poor.

The treatment of enlarged prostate obviously requires the prevention, so far as possible, of all circumstances tending to promote its increase. With this view the patient should live sparingly, scrupulously avoiding all articles of food and drink which he knows from experience to have a stimulating effect on the organs connected with the gland, take proper exercise, and preserve the bowels in an easy state by means, if necessary, of gentle laxatives, or injections of mild fluids into the rectum. During the paroxysms of the disease, rest in the horizontal posture, the hip-bath, leeches applied to the perineum, small doses of laudanum, or solution of the muriate of morphia, with a few drops of balsam of copaiva, opiate injections into the rectum, and a diet restricted to little more than mucilaginous drinks, are the means which prove most effectual in affording relief. Should the flow of urine not only be rendered difficult, but be altogether impeded, it may become necessary to introduce the catheter. The instrument selected should be of a medium size and ordinary form, managed so as to suit the direction which the canal takes in consequence of the elevation of the vesical extremity by the swelling of the prostate. When much difficulty has been experienced in introducing the catheter, it should be allowed to remain in the bladder for a day or two. Various medicines have been employed to induce absorption of the tumor, as iodine and the muriate of lime; but no real advantage has ever been derived from these means. It has also been proposed to cut out the enlarged prostate; but this proceeding is so inconsistent with the dictates of rational surgery that the objections to it need not be taken into consideration.

Earthy concretions are not unfrequently found in the ducts of

the prostate. They are generally of a very small size, which only in rare cases equals that of a pea, of a rounded figure, and reddish-brown color. Their composition is invariably phosphate of lime, with a little animal matter. They usually exist in great numbers together, being either imbedded in the substance of the gland, or collected into groups which occupy the dilated ducts. The symptoms which they occasion are not well ascertained, since their existence is seldom known until it is discovered after death by dissection. On several occasions, having cut into the membranous part of the urethra to remove a concretion that was felt there, I have found the prostate hollowed out into a cavity containing calculi, which were extracted with success.

Extravasation of Urine, and Puncture of the Bladder.

When retention of urine, from whatever cause it may proceed, is not remedied, the pressure occasioned by the confined fluid at length induces ulcerative absorption, and forms a breach which allows the urine to escape into the surrounding cellular substance. This rupture, as it is improperly termed, usually takes place immediately above the obstruction; and as most cases of complete retention depend on stricture at the bulb, the aperture generally occurs in the membranous part of the urethra. When the bladder gives way in such circumstances, it does so most frequently near the neck, where there is no covering of peritoneum. The urine no sooner begins to flow through the preternatural channel, than the patient experiences relief from the distress he previously suffered, and can hardly be persuaded that he is not making water in the ordinary way. The extravasated fluid may diffuse itself in all directions—upward between the bladder and pubis, and laterally by the sides of the prostate, and downward into the scrotum. The fascia, which lies under the integuments of the perineum, prevents the formation of any tumor in this situation; but when the fluid gets through the less dense membrane opposite the scrotum, it speedily distends the loose cellular substance and produces a large globular swelling. The urine, after being thus effused, soon excites great irritation, the effects of which are intense local inflammation, and constitutional disturbance of the most alarming character. The distended scrotum becomes first

red, and before many hours black, while the system suffers as if influenced by some deadly poison; a quick small pulse, dark-colored tongue, frequent vomiting, incessant hiccough, and low delirium are the indications which betray this dangerous condition; and death soon closes the scene unless some active means of relief are speedily and successfully administered. A free incision should be made in the perineum, through the fascia, and down to the infiltrated cellular substance. The scrotum may be scarified also, and hot fomentations ought to be applied to promote the discharge of putrid urine, blood, and sloughs; while, at the same time, the patient's strength is diligently supported by wine and other cordials. If the urine has insinuated itself extensively into the cellular substance of the pelvis, all these means will be unavailing; but if it has been chiefly confined to the scrotum and neighborhood, a cure may be accomplished with careful management, and after a long confinement. A surgeon should never hesitate to make free incisions in such cases, however desperate they may at first appear, since recoveries have taken place in apparently the most hopeless circumstances, when extensive sloughing was complicated with the weakness of old age.

In some rare cases the opening is formed into the rectum, and then the patient may escape the dangerous consequences of urinary effusion which have been described; but such an occurrence is too rare to afford any reasonable ground for expecting relief from the unaided powers of the system, or withholding the means that effect evacuation more safely. These means consist in puncturing the bladder, so as to draw off its contents without allowing them to enter the cellular substance. If the surgeon possesses the requisite tact for introducing instruments into the bladder through the urethra, and has the treatment of the case from its commencement, he will very rarely, perhaps never, be under the necessity of resorting to this puncture. But should he not be able to draw off the water by the catheter, either from his own want of dexterity or from the existence of obstacles caused by mismanagement, there can be no hesitation in having recourse to the operation. Puncture of the bladder, however performed, is always attended with more or less danger of urinous infiltration; but a doubtful remedy is better than none; and there are few states of disease more hopeless than complete retention of urine, permitted to follow its own course.

There are three methods of puncturing the bladder—1, above the pubis; 2, by the perineum; 3, from the rectum. The operation above the pubis is performed by making an incision an inch and a half long from the symphysis upward, exactly in the mesial plane, and then separating the edges of the recti, or rather pyramidal muscles, with the fingers and a little assistance from the knife, and lastly pushing a trocar into the distended bladder, which can now be distinctly felt. In order to avoid transfixing the neck, it is necessary to direct the instrument not perpendicularly, but obliquely backward, from the point where it enters the cavity behind the pubis. The rigidity of a silver tube is apt to occasion injurious irritation, particularly as it must be long, and deeply introduced, to prevent any risk of its escape from the contraction of the coats of the bladder; but the canula must not be withdrawn without substituting some other channel for carrying away the urine, which otherwise would be very apt to enter the cellular substance. A piece of flexible catheter answers very conveniently for the purpose, and the exchange should not be effected before the end of at least twenty-four hours. The patient should lie on his side, inclining forward, to promote the discharge of urine; and great care must be taken that the tube does not become obstructed by mucus, or in any other way. When the cellular substance surrounding the wound has become consolidated by adhesive effusion, as happens in a day or two, a plug may be fitted into the orifice of the canula, and withdrawn from time to time; but it generally happens that the old passage is soon restored after the bladder has been freed from the irritation of its accumulated contents.

The bladder may be reached from the perineum by making a deep incision in the line extending from the bulb to the anus, and then pushing a straight bistoury, guided by a finger in the rectum, into the membranous part of the urethra.

Puncturing from the rectum may have been suggested by the opening which is sometimes formed naturally between it and the bladder, or prostatic portion of the urethra. In cases of complete retention, where the parts are not altered by disease, there can certainly be no easier or more satisfactory mode of relieving the patient by operation. The bladder behind the prostate, for the extent of an inch or more, is not covered with peritoneum; and

the *vesiculæ seminales*, though they meet together at the gland, diverge from each other in proceeding backward, so as to leave sufficient space for the puncture. The *vasa deferentia* lie near the center, and may perhaps be injured, even though the trocar is introduced exactly in the mesial plane; but any inconvenience that might be expected to result from this source ought not to be regarded as a serious objection to a proceeding which affords the only means of averting nearly certain death, especially as experience does not confirm the apprehension. When the operation is performed, the patient should be laid on his back at the edge of the bed, with his knees bent and thighs held up, so as to present the parts fairly to the surgeon, who, having anointed the fore and middle fingers of his left hand, introduces them gently into the rectum until he feels the posterior confines of the prostate. The trocar, which should be six inches long and curved, is then carried in along the channel formed by the fingers, and when its point has passed beyond the prostate, the handle is depressed, so as to puncture the coats of the rectum and bladder where they are contiguous. The canula should be secured in its place for twenty-four or forty-eight hours, to prevent the wound from closing before the obstruction that existed in the natural passage has been removed.

Urinary Calculi.

The bladder and other parts of the urinary passage frequently become the seat of concretions, which vary extremely in their number, size, and composition, but almost always occasion very distressing symptoms. The measures which have been devised for their prevention and removal consequently demand much attention; and, in order to understand them, it is necessary to be first acquainted with the origin and mode of formation of the different kinds of calculi.

The urine in its healthy state holds a number of saline substances in solution, which it deposits in part on cooling to the ordinary temperature. The quantity of this precipitate varies according to the degree in which the urine is diluted, being most observable after abstinence from drinking or profuse perspiration. It generally appears in the form of a light-colored yellowish cloud, occupying the lower part of the vessel, or in that of a thin crust

or lining, which adheres to its sides. When chemically examined, the light-colored muddy-looking sediment is found to consist of alkaline and earthy salts, which are chiefly the phosphate of lime and the triple phosphate of magnesia and ammonia—the lateritious or crusted deposit, on the contrary, consisting of uric acid, or urate of ammonia with an excess of acid. In consequence of a variety of circumstances which will be more particularly considered hereafter, the urine becomes loaded with these matters in quantities, proportions, and combinations that give rise to concretions of various kinds. It appears that the fluid is sometimes secreted so overburdened with its acid or saline constituents as to deposit them immediately on escaping into the pelvis of the kidney, and form concretions, consisting by far most frequently of uric acid, but sometimes of the oxalate of lime. If the urine is not so loaded as to free itself immediately after being secreted, it does not afford any deposit so long as it is kept within the body and maintained at its temperature; but when it is excreted and cooled down to the temperature of the air, it deposits all the redundant portion in the form of a copious muddy yellowish-white precipitate, containing the earthy salts—a lateritious crust, consisting of the acids and acidulous combinations of ammonia. If, however, while such an excess of the urinary constituents exists, a foreign body should be present in the bladder or in any other part of the passage through which the urine flows, so as to serve as a nucleus for concretion, it will, on the well-known principle observed to regulate the separation of salts from their solvents, whether in a crystallized form or not, induce the redundant matters to withdraw themselves from the attraction of the fluid, and adhere to the surface which is presented to them. This effect, however, can occur only where there is a considerable excess of saline substance, since, when the portion is small, it is retained in solution by the urine, at the high temperature which it has in the bladder, too powerfully to permit its precipitation by the influence of a foreign body. Urinary calculi which have attained any considerable size are hence found to consist of concentric layers, varying in composition and thickness according to the nature and quantity of the morbid excess that existed in the urine at the time of their formation; and, for the same reason, the rapidity with which they increase in size always bears a direct proportion to the derangement of the urinary secretion.

The circumstances which tend to occasion excess in the acid and saline constituents of the urine are chiefly the following: 1. Imperfect digestion, attended with acidity of stomach; in which case the urine has a deep brownish-red color, and deposits either crystallized grains of uric acid that have separated from the fluid in the kidney, or a red lateritious sediment on cooling. 2. An irritated state of the kidneys, attended with pain of the loins, quickness of the pulse, and anxiety of the countenance; in which case the urine is copious, pale-colored, and deposits such a quantity of the phosphates on cooling as to become turbid and white like milk. 3. A similar state of irritation, chiefly affecting the bladder, and attended with a copious secretion of mucus; in which case the urine has a very disagreeable ammoniacal odor, and deposits the triple phosphate of magnesia and ammonia, either crystallized or amorphous. The condition of the urine during the deposition of oxalate of lime, and some animal substances that will be mentioned hereafter, has not yet been well ascertained.

From an attentive consideration of these circumstances, it appears that the presence of a calculus may promote the formation of concretions from the urine—1. By affording a nucleus; 2. By irritating the bladder, increasing the quantity of mucus, and accelerating the putrefactive decomposition of the urine, during which the urea is converted into ammonia and an excess of the triple phosphate results; 3. By causing sympathetic irritation of the kidneys, which perverts their secreting action, and leads to the formation of the earthy salts in redundant quantity; 4. By sympathetically irritating the stomach, and occasioning imperfect digestion, attended with acidity. By operating in one or more of these modes, the nucleus, when once formed, always increases, and even tends to cause the generation of new ones. The nucleus, unless when consisting of a foreign body introduced into the bladder, is almost invariably constituted by a concretion formed in the kidney. This renal calculus, in the great majority of cases, as has been already observed, is an aggregation of uric acid grains, but may also consist of oxalate of lime. It is often observed by patients that, previously to suffering from the symptoms of calculus, they were accustomed to pass red grains of uric acid—sand or gravel as they are usually called—and that they ceased to do

so for some time before the commencement of their complaint. It is extremely difficult to account for the origin of these concretions further than has been already done, though there are doubtless some important causes in operation which hitherto have not been ascertained. Calculous diseases are much more common in some districts of country than others, and all that we know in regard to the difference of these is, that where the strongest predisposition has been observed, the mineral strata of the neighborhood were of a calcareous nature. The formation of renal nuclei takes place most frequently before puberty, and after the age of fifty; but no time of life is altogether exempt from it. There is no temperament or variety of original constitution that seems particularly favorable to the occurrence of the disease, but there is occasionally observed some evidence of the predisposition being hereditary. Gout and stone are often connected, but they probably are so from owing their origin to the same source, viz., derangement of the digestive organs.

The symptoms of a calculus in the kidney are an almost constant feeling of uneasiness in the loins, aggravated by rough motion, and soothed by rest; the discharge of small fibrinous clots with the urine after fits of irritation, and during their continuance, tenderness of the loins, nausea or vomiting, and frequent desire to make water, which is sometimes attended with pain at the point of the penis. If, while there are such symptoms, the bladder should be examined and found to contain no calculus, there will be strong ground of suspicion that one exists in the kidney; but there can hardly be any certainty acquired on the subject, as different morbid states, not only of the kidney, but also of other parts of the urinary apparatus, produce nearly, if not altogether, the same indications.

The object of treatment in this case is to promote the descent of the calculus into the bladder, with which view the patient should take exercise, and drink largely of diluent fluids. Advantage seems sometimes derived from conjoining the latter with a small quantity of spirits, such as Hollands, or with the tincture of cantharides; but caution must be observed in doing so, lest too much excitement be occasioned. The calculus, if it remain in the pelvis of the kidney, does not increase rapidly in size, as the urine, from passing away through the ureter immediately

after being secreted, has little time to deposit the excess of solid matters which it may contain. Sometimes, however, the concretion of uric acid enlarges so as to occupy the whole pelvis and infundibula, branching out like a piece of coral, or becomes incrusted with the triple phosphate. Much more frequently the calculus remains of a small size, ranging from that of a pea to that of a field bean, of an oval figure, very similar to the stone of an olive, and smooth reddish-brown surface, in which the component grains may in general be distinguished. In some rare cases abscesses have been produced by the irritation of the kidney, and in others still more rare, the matter, by inducing absorption of the parietes of the abdomen, has made a passage outward for the stone. Exaggerated reports of such occurrences have given rise to stories of renal calculi having been cut out, and Nephrotomy has been seriously proposed by surgeons who think more of the execution than the consequences of operations.

When the calculus descends into the ureter, unless of very small size, it occasions great local pain, and sympathetic irritation of the abdominal viscera. The patient complains of intense pain in the inguinal region of the affected side, about midway between the superior anterior spinous process of the ilium and the pubis, which is greatly aggravated by pressure or motion. There is incessant nausea, and frequent bilious retching. The stream of urine pressing behind the calculus, and widening the passage while it forces the obstructed body forward, at length conveys it into the bladder, immediately upon which all the uneasiness is at once removed. This process of descent, which usually occupies from twelve to forty-eight hours, may be expedited and rendered less painful by administering from time to time doses of castor oil, with the muriate of morphia or other preparations of opium —by throwing opiate injections into the rectum—by placing the patient in a warm-bath—and by bleeding from the arm if he is of a robust habit. Sooner or later the passage is completed, and there are few preparations more rarely met with in museums than those showing a renal calculus arrested in the ureter.

Having arrived in the bladder, the calculi either remain there, or proceed onward through the urethra. In the former case, they become incrusted with layers of various thickness and com-

position, as has been already explained, and constitute concretions which differ widely, according to the circumstances that attend their formation. The following arrangement includes the most important kinds:

Name.	*External Characters.*	*Chemical Characters.*
I. Uric Acid Calculus. (Scheele, 1776.)	Color, brownish-yellow; surface smooth, or elevated into small tubercles; shape generally flattened-oval; size, from that of a large egg, downward; structure laminated; very common.	Gradually consumed before the blow-pipe; soluble in caustic potash; insoluble in diluted acids; but soluble in nitric acid, the solution affording, on evaporation to dryness, a bright carmine-colored residue.
II. Phosphate of lime, C. (Wollaston, 1797.)	Color, pale-brown; surface smooth, like porcelain; structure loosely laminated; small size; extremely rare, as forming entire concretions, but not so unfrequently constituting alternate layers with other matters.	Whitens when exposed to the blow-pipe; soluble in muriatic acid; insoluble in caustic potash, and does not give off ammonia.
III. Triple phosphate of magnesia and ammonia, C. (Wollaston, 1797.) (See frontispiece.)	White shining crystals, or white crust, not forming entire concretions, but coating the surface, or lying between the layers of others, and never exhibiting in its own structure a laminated arrangement.	Diminishes under the blow-pipe; exhaling an ammoniacal odor, and at last suffering imperfect fusion; soluble in dilute acids, and insoluble in caustic potash, but gives off ammonia.
IV. Fusible calculus, (consisting of a combination of the two last.) (Wollaston, 1797.)	Color, white like chalk; shape that of the cavity in which it lies; size often very large; structure laminated, or compact and friable; common, as an incrustation of foreign bodies.	Readily fused under the blow-pipe into a transparent glass; partially soluble in acetic or dilute sulphuric acid, and the remainder dissolved by muriatic acid; insoluble in caustic potash, but gives off ammonia.
V. Mulberry, or oxalate of lime, C. (Wollaston, 1797.)	Color, very dark-brown; surface rough, with large tubercles; consistence very hard; size seldom exceeding that of a walnut; structure compact, always single.	Under the blow-pipe expands, and effloresces into a white powder, which when moistened, and applied to turmeric paper, causes a red stain; not soluble in pure alkalies, nor in the muriatic and nitric acids unless finely powdered and assisted by heat.
VI. Cystic oxide, C. (Wollaston, 1810.)	Yellow, semi-transparent, glistening; structure compact; confused crystalline mass; small; very rare.	Exhales a peculiar odor under the blow-pipe; very soluble in acids and alkalies.

The symptoms of stone in the bladder are—1. Pain felt in making water, especially when the last drops are expelled, and for some time afterward, referred chiefly to the point of the penis, but also to more distant parts, as the inner side of the thighs, testicles, particularly the left one, and even the feet. 2. Uneasy feelings of a similar kind, but not so intense, experienced upon any sudden motion of the body. 3. Frequent desire to make water, varying in degree from slight diminution of the length of the intervals, to almost incessant calls, which it is impossible to resist. 4. The urine being tinged with blood after rough motion. 5. An occasional interruption of the stream of urine. 6. A peculiar expression of suffering and anxiety in the patient's countenance. These symptoms vary extremely in their positive and relative severity, being always most intense when there is irritation of the bladder or general system, and bearing a direct proportion to the degree in which the urinary secretion is deranged; a fact not easily explained, but very important in respect to the treatment of the disease. Thus, contrary to what might be expected, the least annoyance attends the mulberry calculus. The uric acid kind are accompanied with more, and the phosphates with most of all. As there are other diseased states of the urinary organs which give rise to complaints more or less similar to stone in the bladder, it is necessary for obtaining certain proof of its existence to introduce an instrument into the bladder, and search it. The operation performed with this view is named Sounding, and is executed by means of metallic instruments variously formed.' The one that will generally be found most convenient is a steel bougie of the size usually rated No. 7 or 8. It should be moved about methodically into every part of the bladder, while the patient lies reclining. If the point grazes against the rugæ of a thickened muscular coat, an inexperienced surgeon may be misled into supposing that there is a stone; but if it really encounters one, there will hardly be a possibility of misinterpreting the distinct sensation which is always felt, and the corresponding sound generally heard at the same time. A small stone may escape detection, from the bladder being too much distended or too much collapsed; and when either of these sources of fallacy is suspected, a catheter should be introduced to draw off the water, or convey in a suffi-

cient quantity from a syringe or elastic bag. If the parts about the neck of the bladder are very irritable, and grasp the sounding instrument tightly, soothing measures, such as gentle evacuation of the bowels by castor oil, opiate injections into the rectum, and the warm-bath, ought to be employed. When the prostate has suffered enlargement, a sort of pouch is generally formed behind it, in which the stone may lie so as to be hardly tangible by the sound, unless placed more within its reach by altering the position of the patient, or elevating the bladder by a finger introduced into the rectum.

The treatment of stone in the bladder may be divided into palliative and radical. The former consists in the use of means which tend to prevent the concretion from increasing, and to alleviate the patient's sufferings; the latter, by removing the calculus, affords effectual relief from all the uneasiness of the disease.

The means used with a palliative view are such as may be expected to correct derangement of the urinary secretion, and thus not only remove that excess of acid, or saline constituents, which is essential for the occurrence of concretion, but also diminish the severity of the symptoms resulting from the calculus actually existing, since these, as has been already observed, always correspond directly in their severity with the degree to which the secretion of urine is morbidly altered. In order to determine what remedies ought to be prescribed for this purpose, the urine of the patient must be examined. If it shows the characters which denote an excess of acid, alkaline medicines will be indicated. Of these the carbonates of soda and potash are the best, and may be administered in the dose of a scruple or half a drachm, two or three times a day, dissolved in a tumbler of water. Lime-water and soap-ley were formerly much used in various forms and combinations, in the expectation of their producing a solvent effect on the stone; and the relief experienced from them was often so great as to afford apparently good ground for believing that they possessed such a power. It is admitted now that they could act beneficially only by correcting morbid derangements of the urinary secretion; and they are, therefore, superseded by the less nauseous alkaline preparations above mentioned. If, on the contrary, the quantity of earthy and

alkaline salts seems to be redundant, acids should be employed. The muriatic is usually preferred, and may be given in the dose of twenty or thirty drops, in a sufficient quantity of water, three times a day. When, along with this state of the urine, there exists much irritation about the bladder and kidneys, as is generally the case, small doses of opium ought to be conjoined with the acid; and other means of a soothing kind, as the hip-bath and opiate injections, at the same time prescribed. Whatever be the nature of the derangement, it will always be proper to correct any errors in the patient's diet or mode of living that tend to injure the health in general and the digestive functions in particular.

The means which are employed with the view of effecting a radical cure, may be considered under three heads, accordingly as they act: 1. By promoting the escape of the stone entire through the natural passage; 2. By breaking down the stone into fragments small enough for being carried out with the stream of urine; and 3. By cutting a free outlet for the stone.

Renal calculi of small size generally remain only a short time in the bladder, and pass out with the urine often almost immediately after descending from the ureter. When the history of a case leads to the suspicion of there being a concretion of this kind remaining in the bladder, or if it should be detected by sounding, its exit ought to be assisted by a very complete dilatation of the urethra by means of bougies, by drinking copiously of simple diluent fluids, and by the relaxing influence of warm bathing. Cases sometimes occur in which the calculus has entered into the urethra, and after passing through more or less of its extent, has been arrested at a narrow part of the canal either natural or resulting from stricture. The membranous portion is the most common seat of this occurrence, which also happens sometimes at the orifice. A retention of urine occasionally results from the obstruction thus caused; and if a full-sized catheter were passed without any precaution, it might push the concretion back into the bladder, which of course ought to be avoided. The instrument should be merely carried down so far as to disengage the calculus from the contracted place that it occupies, and which it closes like a spherical valve; or, if of a very small size, it may be conveyed past the concretion into the bladder. The immediate

bad effects being thus obviated, it is necessary to employ means for assisting the stone to pass forward. Bougies of progressively increasing size, introduced down to the seat of obstruction, may prove sufficient for this purpose. Forceps are used with hardly any advantage, from the difficulty of expanding their blades. When it proves impossible to extract the calculus from the urethra, it ought to be cut out, which is readily effected by making an incision upon it while held firmly, so as to prevent any displacement during the operation, or upon a grooved staff. The wound sometimes heals by the first intention, but it is prudent to keep a catheter in the urethra for a few days, to prevent any risk of the urine infiltrating into the cellular substance. Calculi are sometimes lodged in fistulas of the perineum, and, of course, so long as they are permitted to remain, render a cure by the ordinary means impracticable. If discovered in this situation, they should be removed without delay by incision.

The second mode of removing a stone from the bladder consists in grinding it down to powder, or pieces small enough for escaping by the natural passage. Though there are very ancient traces of this practice, and though in modern times ingenious patients have occasionally, by persevering efforts, succeeded in bringing away part, if not the whole, of calculi from which they suffered, yet Lithotrity, as this method of operating has been named, may be regarded as of recent origin. The apparatus was necessarily very inefficient and unmanageable so long as the canula through which it was introduced into the bladder had a curved form. Some anatomists of the last century suggested that a straight instrument might be passed along the urethra; but Dr. Gruithuisen (1813) first used a straight catheter. The contrivance of this gentleman, followed by the successive improvements of Amussat, Leroy, Civiale, and Heurteloup, rendered the lithotritic apparatus wonderfully perfect. It consisted of a straight canula, containing another of steel the extremity of which was cleft into three branches, that expanded by their own elasticity when pushed beyond the external tube, and closed upon being drawn within it. This internal canula in its turn inclosed a solid rod of steel, terminating in a head so figured as to act destructively on a stone submitted to its rotatory motion. At the other extremity of this apparatus there were additional parts, for preventing the escape of

the urine without impeding the motion of the canulas or perforator, and for attaching the string of a drill bow. When the stone was large, a compound perforator could be employed, having a movable branch at its extremity, that might be separated to more or less distance from the central position by a regulating screw at the other end, and excavate the stone to an extent corresponding with the degree of its expansion. The thin shell thus formed was broken by another instrument, named *brise-coque*, which consisted of an instrument shaped like a slightly curved Sound, and having its extremity formed into strong jaws, which were made to separate and embrace the stone, which was then crushed by the blows of a hammer or the force of a screw. The latter apparatus has come to supersede the former one for the whole operation, which is, therefore, now named Lithotripsy or crushing, to distinguish it from the grinding process. It is needless to describe particularly the various instruments employed, since description alone could give no precise idea of their structure, and still less of their exercise. The general principle, as already mentioned, consists in the separation of two jaws by pushing one before the other, and then, after grasping the stone, approximating them by the force of a screw or simply manual pressure.

Great improvements have been made in the instruments employed for crushing stones in the bladder, attended with a corresponding degree of facility and success in their employment. The operation may now be conducted with propriety by any practitioner who is accustomed to manipulate the urethra and bladder; and when the stone is not so large as to require frequent repetition of the process, it may be removed in this way with wonderfully little disturbance to the patient. But if there is any prospect of a prolonged and laborious conflict with the fragments, it is much better to extract the concretion entire through incision, than to incur the danger of exciting chronic inflammation of the bladder.

Chronic inflammation of the prostate gland or mucous membrane, if excited by the pressure or laceration of the instrument, will probably lead to further derangement of the urinary secretion, and the consequent deposition of new calculi,—the irritation caused in extracting which will keep up the train of morbid action, and if not at length fatal to the patient, must at all events make him suffer much more than he would have done from excision of the stone.

When the operation is to be performed, the patient should be placed reclining, with his pelvis a little elevated. The crushing instruments must not be introduced when the bladder is empty, as its coats could then hardly escape injury; but it is not expedient to inject water for the purpose of distention, as it is apt to escape by exciting the contractile effort of expulsion. A better plan is to allow accumulation of the urine to the requisite extent, since there is then less tendency to evacuation, while the capacity of retention affords the best evidence of the organ being sufficiently free from irritability to warrant the operation. Chloroform should not be administered, since pain is a sure sign of some error in the procedure, and therefore if prevented from being manifested, can no longer act as a useful beacon to the operator. The patient should be placed on his back, with the pelvis raised by a firm pillow, so as to let the stone lie, not at the neck, but in the posterior fundus of the bladder. In searching for the concretion or its fragments, the instrument should not be moved about at random with expanded jaws, but be carefully conveyed to the side of the body which it is desired to seize, and then, having one blade elevated, while the other remains in its place, be fairly turned round and closed upon the stone. It is impossible to explain, any more in this than other operations, all the minutiæ of minipulation which are requisite for its successful performance. Practical experience, and familiarity with the instruments employed, are essential for a perfect execution of the process, which is one of those that may be performed with advantage on the dead subject.

There is no operation of surgery which has excited so much attention, and been practiced in so many different ways, as Lithotomy. A prejudice, that it was unsafe to cut the neck of the bladder, for many centuries paralyzed all exertions in improving the operation, which, in accordance with this misleading principle, was performed by making an incision in the perineum, and then nominally dilating, but really tearing, the orifice of the bladder sufficiently to allow the stone to be extracted. Such a procedure being tedious, painful, and dangerous, was justly dreaded both by patients and surgeons, the latter of whom willingly resigned it to irregular practitioners of rupture curing, and cutting for the stone, who in those days traveled the country in search of employment. The mode of performing lithotomy was indeed taught

in the schools, and ingenious men contrived various modifications of the apparatus; but no real improvement was effected until near the end of the seventeenth century, when Frère Jacques introduced an entirely different method, which was to cut freely into the bladder. He commenced his career as a lithotomist, unacquainted with anatomy, and provided with very imperfect instruments,—but nevertheless extracted the stone with such invariable facility and dispatch, that though many of his patients died, and comparatively very few made complete recoveries, he acquired great reputation, and the friendship of some of the most distinguished surgeons in Paris. Through their assistance he supplied the defects of his education, and afterward operated in various countries with distinguished success. The important truth having thus been ascertained that the bladder could be cut without any fatal or injurious consequences, the attention of surgeons took a different direction, and a variety of methods and instruments were contrived for cutting the same parts that had been previously torn. It is unnecessary to consider these particularly, as the operation practiced and described by Cheselden (1720), though perhaps not differing materially from that of some other surgeons both in this country and abroad, has been generally regarded the standard for imitation.

The lateral operation of Cheselden consists in making a free incision of the perineum,—opening the urethra at its membranous part, and continuing the cut through the prostate gland, obliquely outward and downward. The simplest mode of effecting this is to use a scalpel, or other knife that may be under the surgeon's command; but as it requires an accurate acquaintance with the relative situation of the parts concerned, and considerable manual dexterity, to divide the prostate safely with such an instrument, various apparatus have been contrived for cutting in the requisite direction, and to a sufficient extent, merely in consequence of their form and construction, and without the necessity of precise guidance on the part of the surgeon. But after a hundred years' experience of such substitutes for operative skill, it is now almost universally admitted that the simple knife is by far the safest means for the purpose, and it does not seem necessary to enter here into any description of the obsolete procedures which used to occupy so large a portion of systematic surgical writings. The

instruments required are—1. A grooved staff to guide the knife in cutting into the bladder. It ought to be of the largest size that the urethra will readily admit, which is usually about No. 11 of the bougie scale, and the groove should be very wide and deep, neither on the side nor convex surface, but in the intermediate space, so as to correspond with the direction in which the incision is carried. Mr. Aston Key recommended a straight staff,—which certainly has the advantage of conveying the knife more directly than a curved one, but is liable to the objections of occupying the operator's left hand while the section is made, instead of leaving it at liberty to press aside the rectum, and also of exposing the artery of the bulb to danger. 2. A knife which, including both the handle and blade, should be between seven and eight inches in length. The edge of the blade should be blunt, except to the distance of an inch and a quarter from the point. 3. Forceps for extracting the stone, of two or three different sizes, of which the blades should be broad, moderately hollowed, and destitute of projecting teeth, which are apt to break the calculus. 4. A scoop to remove fragments or gravel. And 5. A flexible tube, about six inches long and half an inch wide, to convey away the urine after the operation, and prevent its infiltration into the cellular substance.

The parts that require to be cut are—1. The integuments, which should be divided to the extent of about three inches in an adult, or more if the subcutaneous adipose tissue is unusually thick, and of course less in children. The incision should extend obliquely from the raphe of the perineum to the hip, passing nearly equidistant between the anus and tuberosity of the ischium. 2. The transverse muscle of the perineum, and interior part of the *levator ani*. 3. The transverse artery of the perineum. 4. The membranous part of the urethra. 5. The prostate gland through the whole extent of its left lateral lobe. And the parts which ought not to be cut are—1. The rectum, which may be injured in laying open the perineum, in cutting into the groove of the staff, and in dividing the prostate, but chiefly in enlarging the wound in case it proves too small subsequently to withdrawing the staff. 2. The artery of the bulb of the urethra, and the bulb itself, from cutting into the canal too far forward, and at its lateral part. 3. The pudic artery, from cutting too much in a

lateral direction in making the section of the prostate. 4. The internal fascia of the perineum, or vesical reflection of the pelvic fascia, from cutting the prostate upward, or carrying the incision beyond it in a lateral direction.

When the operation is to be performed, the patient should have his bowels freely evacuated by a laxative administered the day before. He should be placed reclining on a table about two feet and a half high, covered with a folded blanket, and under his head a pillow or two may be laid, but nothing to raise the shoulders. He is then to seize the soles of his feet, one in each hand, which should rest on the fibular or outer edge, and by means of a strong tape or bandage have the limbs secured in this position, after which they are to be confided to two assistants, one standing on each side of the table. The staff having been introduced is now to be committed to a third assistant, who holds it in one hand and the scrotum in the other. The surgeon then seats himself on a chair, shaves off the hair from the perineum, feels the different parts that determine the place of his incision, and resting the fingers of his left hand on the skin so as to prevent any displacement of it, pushes his knife directly inward at the anterior point of incision to the depth of the perineal muscles. He cuts in the direction above mentioned so as to divide the skin, fat, superficial fascia, and transverse muscle, gradually diminishing the depth of his incision until it reaches its posterior termination; then introducing the fingers of the left hand into the wound, to serve as a guide for the knife and protection to the rectum, he cuts so as to divide the anterior part of the *levator ani* and expose the membranous portion of the urethra, into which he makes an opening, and then, keeping the knife in the groove, while he satisfies himself, by taking the staff in his left hand, that it is held properly in the mesial plane close up against the pubis, he gives it again to the assistant, and pushes the knife steadily into the bladder and fairly through the prostate; at the same time, with his left hand, holding down the rectum, and feeling what way is made with the knife. He then introduces his finger into the bladder, desires the staff to be withdrawn, and conducts in the forceps. He searches for the stone with the blades closed, and having found it, opens them very wide, depresses, and then closes them. By gently relaxing his hold, and renewing it, he shifts the position of the cal-

culus, if unfavorable for extraction, and, with the assistance of his left fore-finger, proceeds to draw out the stone, not directly, but by a motion in alternate directions, so as to dilate the margin of the wound without tearing. Forcible efforts ought never to be used in doing this; and it is much better to introduce the knife again, if the opening proves too small. After one stone has been removed, the bladder ought to be searched for more, with a sound introduced through the wound; and if any are detected, they must be removed in the same way as the first. Should the calculus be broken, its fragments must be carefully extracted with the scoop if small, or the forceps if large. The tube is then to be introduced, either alone, or, if there is much tendency to hemorrhage, with some folds of lint wrapped round its middle; after which the patient may be placed in bed, on his right side, with the limbs moderately bent.

The after-treatment in cases that proceed favorably is extremely simple. Means must be employed to prevent the urine which distills through the tube from wetting the bed, by interposing a piece of oiled cloth between it and a folded blanket laid under the breech. The diet, during the first three or four days, should be sparing, and of a farinaceous kind. Gentle laxatives, such as castor oil, are to be administered as occasion may require. The tube may be withdrawn at the end of either two or three days. About the ninth day a little urine is generally observed to issue from the urethra; and when the natural passage thus begins to be resumed, the discharge by the wound very soon ceases, so that by the thirteenth or fifteenth day the whole is evacuated by the penis.

The bad consequences of the operation are—1. Sinking; 2. Hemorrhage; 3. Infiltration of urine; 4. Inflammation at the neck of the bladder; 5. Peritonitis; 6. Recto-vesical fistula.

Unless the patient is extremely weak from the exhaustion of disease, or the feebleness of his age, as when it is below two, or beyond seventy years, there is no risk of his sinking directly under the effects of the irritation attending the operation, if properly performed. But if, from the inadequate size of the wound in the bladder or *levator ani*, the stone, instead of being gently extricated, is dragged out by force, after long and painful ineffectual attempts to draw it through, the stoutest individual

may suffer a shock too great for his strength, and die in the course of a few hours, as if suffering from profuse hemorrhage, an extensive burn, or any other injury destructive to the powers of life.

If the vessels are regularly distributed, and the surgeon cuts no more than he ought to do, there is hardly any fear of a fatal or even troublesome bleeding. Should the dorsal artery of the penis rise from the pudic high in the pelvis, and take the course which it has been observed to follow in some few cases, along the neck of the bladder, and obliquely across the lateral lobe of the prostate, it can hardly escape division during the performance of the operation which has been described. The coincidence of such an irregularity with stone in the bladder must be extremely rare; and the danger of hemorrhage from this source so small as to afford little reason for apprehension, though instances of it have occurred. When the flow of blood appears alarming, the surgeon should introduce his finger into the wound and press the pudic against the ramus of the ischium. He will then ascertain whether the hemorrhage proceeds from it or branches given off below, in either of which cases a ligature may be applied by means of a tenaculum, the sides of the wound being held aside, and the source of the bleeding, if necessary, exposed to view more completely by further incisions. If the hemorrhage is found to proceed, not from the trunk of the pudic, the artery of the bulb, or that of the perineum, it must be referred to the neighborhood of the prostate, and all that can be done is to introduce a tube wrapped in lint, raise the patient's breech, and apply cold.

Infiltration of urine takes place when, from the small size of the wound, from its being seated too far forward in the perineum, from an insufficient division of the *levator ani*, or from swelling of the cut surfaces, the urine has not a free outlet externally; and if the incision of the bladder is carried far back, more especially through the reflection of the pelvic fascia on its neck, this untoward event will be more apt to happen. The patient feels first a painful sense of distention, and then an uneasiness in the hypogastric region behind the pubis, which leads to the belief that peritonitis is commencing, and blood is freely withdrawn, both locally and generally, without affording any relief. A fever, attended with the symptoms that denote excessive irritation, com-

mences, continues in despite of every means employed to check it, and proves fatal in a few days. Whenever the urine is not observed within five or six hours after the operation, the surgeon should examine the tube to discover whether or no it is obstructed by coagulated blood,—and if a tube has not been employed, he should introduce his finger into the bladder, so as to make sure of there being a free passage for the fluid, keeping in mind that infiltration of urine, though in general easily prevented, can seldom if ever be remedied.

Inflammation at the neck of the bladder is the bad consequence most to be dreaded. It is attended with pain at the point of the penis, nausea, with disgust at every sort of food, and occasional retching,—yellow furred tongue,—frequent pulse,—and great general restlessness. It proves fatal seldom sooner than one, or later than three weeks. On dissection, the cellular substance at the neck of the bladder is found infiltrated with pus, and the prostate gland also contains purulent collections. The circumstances that seem to have most effect in giving rise to this insidious and deadly process are laceration and contusion inflicted during the removal of the stone, especially if the sensitive and unyielding ring at the base of the prostate in the neck of the bladder be not divided by incision. This texture resists division, and cannot be torn with impunity; so that the safety of the operation depends very much upon the point thus essential being duly accomplished. Little can be done to arrest the inflammation when once excited,—but the means that promise most assistance in doing so are frequent immersion of the pelvis in a hip-bath, and opiate injections.

Peritonitis very seldom follows the lateral operation of lithotomy; but if it should occur, it will appear within twenty-four or forty-eight hours at furthest, and may be recognized by the tenderness of the abdomen to pressure, the small wiry pulse, and cadaverous appearance of the patient. Free depletion, both local and general, warm fomentations, and the warm bath will be the proper remedies.

A communication between the rectum and wound occasions, in the first instance, little inconvenience; but as the cure advances, and the orifice of the wound contracts, the contents of the gut, whether gaseous or liquid, instead of escaping through it, are

forced into the urethra and issue from the penis, while part of the urine descends into the rectum. The only chance of remedy for this disagreeable occurrence is to divide the septum that lies between the external orifice of the wound and its communication with the gut; but this should not be done immediately after the operation, as it has happened that the wound of the intestine, when of small extent, occasioned no trouble, and healed by the first intention.

When the various obstacles to success that have been mentioned, together with the adverse influence of disease in the kidney, which is sometimes associated with stone in the bladder, and also the dangerous consequences common to all severe operations, are taken into account, it will appear obvious that, however perfect the principles on which the operation is performed, and skillful its execution, the patient's recovery cannot be regarded as by any means certain. A succession of fortunate cases often leads an operator to flatter himself with a belief of his own infallibility, but sooner or later he meets with reverses; and it appears that the average of successful practice is one death in from seven to ten cases. The period of life at which the operation proves most successful is between the second and fifteenth year, and next to this from sixty to seventy. The most unfavorable age seems to be about forty or fifty; and it is always observed that when the health is vigorous, and the suffering from the disease slight, the risk is much greater than when the patient is reduced by continued and incessant pain, provided no organic disease has been excited in any part of the system.

Other methods of cutting for the stone have been proposed and followed more or less extensively; but as the success attending any of them has not nearly approached that of the operation which has been fully considered, it seems unnecessary to enter into a particular detail of them, and the four following may be noticed shortly as the most deserving of attention: 1. The bilateral operation; 2. The high operation, or above the pubis; 3. The recto-vesical operation; and 4. The median.

The first of these was contrived by M. Dupuytren, in order to lessen the risk of injuring the rectum and pudic artery. The peculiarity of it consists in cutting the prostate on both sides equally, which is effected by an instrument constructed for the

purpose, and composed of a sheath containing two blades, that can be made to project laterally more or less as may be required. This instrument, being conveyed into the bladder on the groove of the staff, after the preliminary incisions have been made in the perineum in a transverse direction, is expanded and withdrawn in this state, cutting the gland to the requisite extent. Many objections might be urged against this method, but it is sufficient to mention that the result of experience is not in its favor. The High operation is of older date, having been introduced about the close of the seventeenth century, when it was discovered that the bladder could be cut with safety, but the proper principles for operating in the lateral way had not yet been established. It was proposed considerably earlier than this, and had even been practiced in some few cases, but did not engage much attention until the time mentioned. The mode of procedure was to make an incision in the *linea alba*, about three inches long, extending from the pubis upward, separate the recti muscles, and open the anterior or pubic side of the bladder, beginning as near as possible to its neck, and continuing the wound upward to a sufficient extent, with care to avoid cutting the peritoneum, where reflected on the fundus. The advantages contended for in recommendation of this operation were the facility of its performance, even where the stone was of the largest size, the safety of it in respect to hemorrhage, and the comparatively small degree of pain it occasioned the patient. The objection, however, of urinous infiltration, which was equally obvious in theory and serious in practice, more than counterbalanced these arguments; and the means contrived for preventing this dangerous consequence either proved insufficient, or, by their complexity and irritation, destroyed the great ground of superiority contended for. The high operation is now performed by very few surgeons, and will probably soon cease to be practiced at all. The Recto-vesical method was introduced by Vacca and Sanson (1816), and through the influence of their recommendation, together with that of some other surgeons, attracted considerable attention for a few years. It consisted in dividing the *sphincter ani*, rectum, membranous part of the urethra, and prostate, so as to lay the two canals thus far into one, through which the stone could be easily extracted. This was effected by introducing into the bladder a staff grooved on its

convex side, cutting through the sphincter and the integuments of the perineum, and then conveying in a sharp-pointed curved bistoury, which being entered into the groove beyond the prostate, and carried steadily forward, completed the cutting part of the operation at once. It was contended that the stone could thus be got out very easily, and with hardly more pain than what attends the operation for *fistula in ano*—that there could be no danger of bleeding incurred—and that the risk of urinous infiltration, as well as inflammation, would be less than after the lateral operation. The great objection that obviously suggested itself was the probability of a recto-vesical fistula; but the free division of the sphincter seemed likely to diminish the chance of this, and experience proved that it did not often happen. In the hands of an expert operator, this method is perhaps the least difficult; but it certainly must be regarded as decidedly inferior to the lateral operation when properly performed, as well in regard to the danger of its immediate effects, as in prospect of the patient's condition after recovery being accomplished.

When the stone is of no great size, it may be removed very easily and safely by what has been called the Median operation—that is, opening the membranous part of the urethra just as if for the division of a stricture, and then passing forceps with narrow blades into the bladder, a tube being afterward placed in the wound to prevent urinary extravasation.

Retention of Urine in Females.

From the shortness, straight direction, and width of the urethra, together with the absence of a prostate gland, females are much less liable to retention of urine than males. They suffer from it, however, occasionally, in consequence of the following circumstances: 1. Paralysis from distention; 2. The pressure of a gravid uterus; and 3. Retroversion of the uterus.

The female bladder is more capacious than that of the male, and can suffer the accumulation of more fluid without being injured in its contractile power. When, however, the limit of healthy expansion is at length exceeded, the same effect is induced as when the male bladder is concerned, and the patient labors under a complete retention, which requires for her relief that the catheter

should be introduced. The instrument employed for this purpose is made of silver, about six inches long, very slightly curved, and a quarter of an inch wide. The patient lies in bed on her back with the thighs drawn up; and the operation ought to be performed under the clothes. The fore-finger of the right or left hand, according to the position of the patient, is introduced between the *labia minora*, and carried upward to their junction, a little below which the orifice of the urethra is situated, and where it is readily recognized by the feeling of a depression, with a little elevation behind or nearer the vagina. The finger being retained here, the point of the catheter is by its means directed into the bladder. The mouth of the tube may be closed by applying the thumb over it, until a receptacle is provided for the urine,—or a bladder may be tied to it so as to receive the fluid, without any risk of allowing its being spilt upon the clothes. If the catheter has a stop-cock upon it, this will be managed still more conveniently, but the instrument is thus rendered rather too complicated for its easy introduction.

When the uterus is distended, and more especially when its contents descend low in the pelvis during parturition, the urethra is liable to such compression and displacement as frequently induce retention of urine. In such circumstances, it is not always practicable to introduce the common female catheter, and one either flexible, or, if rigid, curved like that for the male urethra, is required. The difficulty is still greater when the retention depends upon retroversion of the uterus. This displacement consists in a turning back of the fundus of the uterus, and its being bent down between the vagina and rectum. It very rarely occurs in the unimpregnated state, though it is said to have been met with in virgins, and is most apt to happen between the third and fourth months of pregnancy, in consequence of some sudden motion of the trunk, as in leaping or dancing. A consideration of the relative situation and connection of the *os uteri* and urethra will render it obvious that the effect of such a retroversion on the latter must be a great extension of it upward and forward; withdrawing the orifice from its usual situation; impeding the discharge of the urine, and rendering the introduction of a catheter extremely difficult. The bladder becoming distended, reacts on the primary disease and opposes the replacement of the uterus, whence the

first object in the treatment is to draw off its contents. This may sometimes be done by means of a flexible or curved silver catheter; but it has happened repeatedly that such instruments could not be introduced, and the patient either died from extravasation of urine, or was saved by puncture of the bladder above the pubis. Should that operation be judged necessary, it is to be performed in the same way as in the male; but especial care must be taken in introducing the trocar not to transfix the elongated and narrowed neck of the bladder, which may happen by directing the instrument perpendicularly, instead of backward toward the promontory of the sacrum. The uterus also has been punctured from the rectum; but this proceeding must be regarded as unwarrantable, unless the other more safe measures have been tried without success. When the resistance of the distended bladder has been removed, the surgeon should introduce the fore and middle fingers of one hand into the rectum, while the other co-operates in the vagina, and endeavor to replace the retroverted uterus.

It may be observed that females, who suffer from uterine excitement or hysterical affections, are apt to complain of inability to excrete the urine, and the catheter is often used in such cases; but warm fomentations applied to the hypogastrium, and cathartic injections thrown into the rectum, will almost always obviate any real necessity for its employment in such circumstances.

Urinary Calculi in the Female.

Females seem to be much less liable to the formation of renal calculi than the other sex, and get quit of them more readily when they do occur, owing to the shortness, width, and dilatability of their urethra. Sometimes, however, calculi are detained after descending from the kidney, and nuclei for concretion are also occasionally afforded by foreign bodies introduced from without, through the urethra into the bladder. The stones, which have their foundation laid in either of these ways, increase in magnitude in the manner already explained, and occasion symptoms analogous to those formerly described. Frequent micturition, the urine tinged with blood, and aggravation of these complaints by rough motion, excite the suspicion of calculus in the bladder, especially if the patient has previously suffered the symp-

toms which indicate the presence of one in the kidney or ureter, and the introduction of a catheter or sound ascertains its existence positively. Women between the ages of twenty and fifty are most frequently the subjects of the disease.

The female urethra being not only very short and wide in its natural state, but also very dilatable, allows small stones to be seized and extracted through it very readily. But when the calculus obtains a larger size, it is necessary to enlarge the opening by incision. This may be readily effected by dilating the orifice so as to admit the finger, and upon it guiding a knife through the resisting ring at the neck of the bladder, after which the textures readily yield. If the stone is very large, so that it requires the vagina to be cut, silver sutures should be introduced to keep the edges in contact.

Incontinence of Urine.

Incontinence, or involuntary discharge of urine, is rarely met with in females, but occurs very often in males. It happens at all ages, and depends on different circumstances. In children, who are frequently subject to it during their sleep, the cause seems to be irritability of the bladder, inducing its expulsive contraction before the fluid accumulates in sufficient quantity to occasion uneasiness enough for awakening the patient. The fear of punishment, or some other strong impression on the mind, may break this disagreeable habit, by inducing a more vigorous resistance on the part of the voluntary muscles situated at the neck of the bladder; since, as is well known, volition is not entirely suspended during sleep. A more powerful remedy, and one that seldom fails when the morbid disposition has no other source than that under consideration, is the application of a large blister over the sacrum and lower part of the loins. A very distressing incontinence is met with in persons of more advanced age, and often in the vigor of life, who have suffered derangement of the nervous system, either from spontaneous disease or the effects of external injury. The complaint is then usually associated with weakness of the inferior extremities, which betrays the nature of its origin, but it sometimes exists alone, and is of itself sufficient to render the patient miserable. Powerful

counter-irritation, especially that effected by the actual cautery applied on each side of the spinous processes of the lower lumbar vertebræ, affords the best chance of relief; and internal stimulants, as cantharides, may be conjoined with this practice, though there is seldom decided evidence of their exerting any beneficial influence. Warm and cold bathing, frictions, and strict attention to the preservation of general health should at the same time be diligently employed; and improvement must not be despaired of though it should be a long while of appearing. Incontinence is common in old age; but in this case is generally confined to the period of sleep, and may be prevented from proving troublesome by introducing the catheter previous to the time of rest. In extreme cases of incontinence, when there is a constant dribbling from the urethra, the patient may be rendered comparatively comfortable by attaching to the penis a bag of India-rubber, provided with a plug or stop-cock, for allowing the urine to escape when a convenient opportunity occurs.

Irritability or Chronic Inflammation of the Bladder.

This complaint is almost confined to males. It is characterized by frequent desire to make water, and inability to resist these calls, however incessant or inconvenient. The feeling before micturition is generally more or less painful, and sometimes extremely so, whence stone or stricture is often supposed to be present, and this supposition leads to the introduction of instruments that greatly aggravate the patient's sufferings. The disease usually occurs in young and middle-aged men. It is occasioned by various circumstances, such as overdistention, which in the first instance causes paralysis of the muscular fibers; the irritation of stimulating food; or chronic inflammation, spreading back from the urethra, or originating in the mucous coat of the bladder in consequence of exposure to cold; or other exciting causes of inflammatory derangement. The treatment consists in using measures of a soothing nature, of which rest, both of mind and body, is an essential one. This, together with a milk diet, copious diluent drinks, and the hip-bath, sometimes proves sufficient. In more severe cases, injections of two or three ounces of warm water, with a few drops of laudanum, or the sedative

solution of opium, may be thrown into the rectum once a day or oftener. Benefit is also derived on some occasions from hyoscyamus and camphor administered in the form of pill, also from ten or twelve drops of balsam of copaiva, with five or six of the sedative solution, taken two or three times a day, and from small doses of Dover's powder, with colchicum. Blisters applied to the sacrum or perineum, contrary to what might be expected, sometimes afford relief, and a seton in the latter situation has succeeded after the trial of other means in vain. The operation of *vesicæ lotura*, or injecting the bladder, has often been used with temporary but seldom with any permanent advantage. A solution of the nitrate of silver is introduced by means of a catheter and syringe, or elastic bag, in such quantity as the irritable bladder is capable of receiving, and allowed to remain until the desire of expulsion leads to its discharge. In cases which derive benefit from this practice, it is observed that the quantity of fluid injected, and the time it is permitted to remain, gradually increase. The disease generally proves extremely obstinate, and is not unfrequently found incurable.

Catarrh of the Bladder.

This title is applied to an inordinate secretion of mucus from the bladder, and discharge of it in the urine, at the bottom of which, when voided, it forms a glairy sediment, sometimes nearly equal in quantity to the fluid. The disease usually occurs associated with the one last mentioned, and, though not necessarily accompanying, hardly exists independently of it. What has been said in regard to the causes and treatment of that affection will therefore apply equally to this.

Hæmaturia.

This, as the name implies, is a discharge of blood, which may occur as a symptom of other diseases, or exist as an independent affection. In the latter case, the hemorrhage is sometimes very profuse, and the blood coagulating in the bladder gives rise to very unpleasant consequences, to remedy which it has been thought necessary to introduce a very wide catheter, having a

syringe adapted to it for sucking out the clots. The discharge of blood may take place either from the surface of the mucous membrane, or from a morbid structure into which it has degenerated. In the latter case, remedial means can be of no use, but in the former it is generally possible to moderate and even subdue the morbid flow, by correcting any derangement of the system that has indirectly occasioned it, by soothing the parts concerned if they indicate excitement, and by administering the tincture of muriate of iron, the *uva ursi*, or other astringent medicines. This disease is most common in advanced age, and may occur to an alarming extent without proving either permanent or seriously injurious. Confinement to bed in the horizontal posture, a mild diet, and palliation of the symptoms, constitute all the treatment requisite for recovery.

CHAPTER XIX.

DISEASES OF THE GENITAL ORGANS.

Gonorrhœa.

By Gonorrhœa is understood an inflammatory affection of the urethra, attended with a discharge of thick yellow fluid. As the inflammatory symptoms subside, the discharge becomes thinner, paler, and at last almost watery, when it constitutes what is called a Gleet. This disease is usually the result of impure intercourse; but whether it requires for its production that the person infecting should have been infected—in other words, whether it is to be ascribed to the influence of a peculiar poison transmitted from one person to another—is not yet fully ascertained. There is great variety in the susceptibility of different individuals, and the matter seems active in proportion to its thickness and yellowness. The watery discharge of a gleet, in persons of ordinary sensibility to irritation, is innocuous, but in others it may occasion the most violent gonorrhœa.

The first symptoms of the disease generally appear from one to four days after the poison has been applied. They consist in itching, redness, and swelling of the orifice of the urethra, and are soon succeeded by a painful burning sensation in the same part, particularly severe during micturition, the calls to which are much more frequent than usual. A thin serous exudation then takes place, at first merely gluing together the edges of the orifice, but quickly becoming more copious, and at the same time acquiring a purulent appearance. While these local changes are occurring, the system suffers general derangement in proportion to its irritability and the acuteness of the inflammation. This symptomatic fever is often attended with local disturbance of different parts. The absorbent vessels of the penis, the glands of the groin, and the testicle are apt to inflame; abscesses form exterior to the urethra; the prostate and bladder participate in the diseased action; and various important consequences thus ensue, which will be particularly considered hereafter. The primary and essential morbid action is confined to the extremity of the urethra, from its orifice to the distance of an inch backward.

The treatment requires, in the first place, purgation, and the antiphlogistic regimen, to moderate the inflammation and allay the fever. The patient at the same time should drink freely of diluent mucilaginous fluids, such as rice-water or linseed tea, and foment the penis frequently with warm water. When the intensity of the disease has been subdued, internal and external means may be employed to stop the discharge. Of the former, the balsam of copaiva and cubeb pepper are the most powerful; and they act much more certainly when administered in substance, than when their virtues are attempted to be concentrated by decomposition into extracts or essences. As the copaiva is not only extremely nauseous, but apt to excite sickness, vomiting, and great general uneasiness, it must be given cautiously, in small doses, combined with camphorated mixture, spirit of nitrous ether, or some such vehicle, and a little laudanum or muriate of morphia. The cubebs may be given more freely, either along with the mixture just mentioned or alone. One or two drachms may be prescribed two, three, or four times a day, either alone or together with the balsam; but in general I believe it is better to abstain

entirely from the use of internal remedies, and trust entirely to local means. These are injections of astringent fluids into the urethra. For this purpose the solutions of alum and several metallic salts, as the sulphates of zinc and copper, the acetates of lead and zinc, and the nitrate of silver, are chiefly employed. No injections should ever be employed until the symptoms of acute inflammation have been subdued; and even then, if the patient has an irritable constitution, they ought to be prescribed with extreme caution. Not more than a quarter of an ounce should be thrown in at once, and the penis should be compressed between the finger and thumb, to prevent the fluid from passing too far back. The injection may be repeated three or four times a day, unless it occasions a renewal of the inflammatory symptoms, when it must be immediately abandoned. If, notwithstanding these means, the running continues several weeks, a full-sized bougie may be passed two or three times, as the irritation thus caused, though its first effect is to render the matter discharged more thick and copious, often puts a sudden stop to it. The tincture of cantharides in the dose of twenty or thirty drops three times a day, sulphate of zinc, given internally in the form of pill, and sea-bathing are the remaining remedies usually had recourse to when the gleet proves obstinate. The first gonorrhœa is generally more severe than those that happen subsequently. In these the inflammatory symptoms are often from the commencement so mild that the means proper for arresting the discharge may be used without delay.

Of the bad consequences or attendants of gonorrhœa, one of the most frequent is chordee or painful erection of the penis. The only effectual remedy of it is to cure the disease; but before this is accomplished, the patient's sufferings may be alleviated by opiate injections into the rectum,—the introduction of opiate suppositories within the *sphincter ani*,—or pills of camphor with hyoscyamus taken occasionally. If the spongy or cavernous substance of the penis remains hard after the inflammation has subsided, and causes pain, together with distortion of the member when it is erected, the part affected may be rubbed with camphorated mercurial ointment, to promote absorption of the condensing lymph that is effused. Inflamed absorbents are met with chiefly on the dorsal surface of the penis, and in persons of a very irritable con-

stitution. They form hard painful cords, over which the skin is red. The best application that can be made to them is a warm solution of acetate of lead and opium. Inflammation of the inguinal glands, or Bubo, does not occur nearly so frequently in consequence of the irritation of gonorrhœa, as of that proceeding from sores of the penis, and, therefore, may be more properly considered in connection with them. Abscesses sometimes form in the cellular substance exterior to the urethra, at all parts of its extent, from the orifice back to the anus. So soon as they are recognized, an incision ought to be made for the evacuation of the matter, which, if permitted to make a way for itself, may cause ulcerative absorption of the mucous membrane. When the inflammation spreads back along the urethra to the bladder, it induces the painful symptoms which have been described under the head of Retention of urine from spasm, and irritable bladder, and requires the treatment that has been already explained in regard to them. Inflammation of the testicle is a common attendant of gonorrhœa, but will be more conveniently arranged along with the other morbid affections of that organ.

Gonorrhœa Preputialis.

A purulent discharge is occasionally induced from the surface of the glans and prepuce in persons who have this covering long, and the lining integument of its inner surface approximating the nature of a mucous membrane. From the tightness of the prepuce in such cases, it is generally difficult to bring the orifice of the urethra into view, and the source of the running is, in consequence, often referred erroneously to the usual seat of gonorrhœa. As this mistake leads to improper practice, it ought to be avoided by carefully drawing back the foreskin until the opening of the urethra comes into view, and then squeezing the penis so as to force out the matter, which will show, by the direction whence it comes, where it has been secreted. The absence of pain in making water affords another good ground of distinction between this form of the disease and the other. The treatment consists in injecting the black-wash four or five times a day between the glans and prepuce.

Warts.

A very common consequence of gonorrhœa, particularly of the preputial kind, is the growth of warty excrescences, chiefly round the neck of the glans, and by the side of the frænum; but they may be seated on any or every part of the surface of the glans and prepuce. These growths vary extremely, both in size and number, being sometimes hardly perceptible, and at others constituting large tumors. They have generally narrow necks, and irregular, rough bodies. They are painful and unseemly, apt to bleed when injured, and, if large, attended with a very fetid discharge. If small, their absorption may be readily induced by a slight application of aromatic vinegar once every two or three days. Various other fluids, powders and ointments, have been employed for this purpose; but the one that has been mentioned seems to be, on the whole, the best. When the warts are large, they should be cut away with scissors close to the sound skin, and even when but of small size, they are removed in this way more quickly as well as effectually.

Sores on the Penis.

The penis, like every other part of the body, is liable to become the seat of ulceration; and its pendulous position, mobility, and proneness to erection much oppose the healing process. With few exceptions, the sores in this situation result from venereal intercourse, being either simply abrasions or lacerations, or the consequence of the irritation of poisonous matter applied to the organ. The former are usually called excoriations, and the latter chancres. The poison gives rise to the ulcer by forming, in the first instance, a small abscess or pustule, which, opening in a few days, leaves a breach in the surface. If an excoriation, at the time of its production, is exposed to the influence of irritating matter, it then exhibits the same characters as if of poisonous origin. The sores of both kinds are generally seated on the lining membrane of the prepuce, near its reflection on the glans, at its orifice and at the sides of the frænum; being more rarely found on the glans itself, or the body of the penis. When resulting from poison,

they are generally small, round, or oval, and excavated, having the base as well as the margin condensed by an interstitial effusion of lymph, and affording a viscid discharge. When caused by violence, they are usually of an irregular figure, and surrounded with more or less hardness, according to the irritation which they have suffered from the matter applied to them. The surface of both kinds is generally gray, yellowish, or ash-colored, and shows no appearance of granulations. The pain is very variable. When the sore is in a highly irritable state, it usually presents either a phagedenic or sloughing character. In the former case the ulcer, which is generally seated on the body of the penis, is round, shallow, and very abrupt at the margin, which is red, while the surrounding integuments are not altered from their ordinary state. It is very painful, and increases progressively, preserving the characters that have been described, and enlarging in superficial extent without becoming deeper. In the sloughing state the sore is surrounded with much tense swelling, and diffused redness. The pain is intense; and the margin of the sore, which is very irregular, at one or more parts exhibits sphacelated spots.

Owing to the peculiarities of their situation, and also of the circumstances which attend their production, sores on the penis are generally very slow in healing, unless properly treated, and even then often require more time for the purpose than might be expected from their size. It was very generally believed until lately, and the opinion is still maintained by many, that the poison which gave rise to chancres was of a peculiar kind, which had not existed in Europe until the latter part of the fifteenth century, when it suddenly appeared at the siege of Naples, having either originated there, or been brought by Spanish soldiers who had imported it from the newly-discovered Western World. This poison of Syphilis, as it has been called, was supposed to produce various other effects besides the primary sore, when absorbed from it into the system: first causing bubo, and then a succession of constitutional disorders that were termed secondary symptoms. Of these the most important were scaly eruptions of the skin, ulceration of the fauces, exfoliation of the bones of the nose, chronic inflammation of the periosteum and bones, ulcers on the surface of the body, cachectic emaciation, and death. It was further believed that mercury, administered so as to produce its constitutional

effect, or feverish excitement with salivation, acted as a certain antidote to this poison, whether operating locally or generally; but that unless it encountered the poison previously to being absorbed from the sores, it merely arrested the morbid derangement in progress, without preventing the occurrence of the other secondary symptoms, which required successive courses of salivation for their remedy. It is now fully ascertained that the poison of the present day, though producing local effects in all respects similar to those described as resulting from syphilis, does not give rise to the dreadful consequences which have just been mentioned, when treated without mercury. The cure may be tedious, and the skin, throat, or periosteum may be slightly affected, but none of the serious effects that used to be so much dreaded ever appear; and even the trivial ones just noticed comparatively seldom present themselves. We must therefore conclude, either that the violence of the poison is worn out, or that the effects formerly attributed to it depended on the treatment. The latter of these opinions is supported by the fact that secondary symptoms of the utmost severity, embittering the patient's existence, and ultimately destroying it, are still met with in the practice of those who employ mercury profusely and indiscriminately; and it is a curious circumstance, which cannot be either explained or denied, that this medicine produces these effects, more especially those on the bones, only in persons who are suffering from venereal ulceration of the genital organs. The quantity of mercury requisite for thus injuriously affecting the system is very variable—depending upon peculiarities of the patient's constitution, either natural or acquired. Of the former, a scrofulous disposition may be particularly mentioned; and of the latter, one of the most important is that occasioned by mercury itself, since a person who has taken it to such an extent as to have been disordered by its operation is ever after very susceptible of its effect. It is generally noticed that those persons suffer most from mercury who are least readily salivated by it.

A fearful system of scientific quackery has, in recent times, been founded upon the ruins of the old mercurial delusion, and although the so-called "modified use of mercury," which is at present so much the fashion in Paris and elsewhere, may not be so speedy in its effect, I can testify, from what has frequently fallen

under my observation, that it empties the pocket and injures the health no less effectually than the process of poisoning which it professes to have so advantageously superseded. In cases where mischief has been done by the administration of mercury, it is sometimes necessary to employ an antidote, and for this purpose the iodide of potassium, in small doses, has rendered the most valuable service. The preparations of sarsaparilla are also much employed to counteract the effect of mercury, as well as syphilis; and the faith in their efficacy is so firmly established, that any expression of my belief that they are utterly inert could hardly excite doubt except in the minds of those who have witnessed my hospital practice, throughout the whole course of which not a grain of sarsaparilla has ever been prescribed.

The local treatment must be varied according to the circumstances of the case. In the first instance, as soon as possible after the appearance of the disease, it is proper to destroy the morbid action of the part by touching it with the nitrate of silver; and then the black-wash, or a solution of sulphate of copper, containing two grains in an ounce, may be applied on a piece of lint. If the orifice of the prepuce is contracted so as to prevent it from being drawn back, the black-wash should be injected four or five times a day, which is better than laying open the foreskin, as the cut surface is sure to take on a similar action with that of the ulcers, and thus prolong the cure. When the sore has a phagedenic character, a bread and milk poultice is generally the most useful application in the first instance, for a few days, and then a strong solution of sulphate of copper, containing a scruple to the ounce, used merely to moisten the surface once a day, with some milder lotion in the intervals, proves most efficient in arresting the progress of the ulceration as well as promoting granulation. The disposition to slough depends on excessive irritability, which in general is owing to too great a power of action, and requires measures of depletion, together with those of a soothing kind. Leeching, scarifying, fomenting, and poulticing, acetate of lead, and watery solutions of opium are the means found most useful for this purpose, and all of them, except the two first, may be used with advantage also when the irritability is associated with weakness of the part. In mercurial sloughing of a chronic character, the best counteragent is caustic potass gently applied.

If secondary symptoms appear, they ought to be treated merely on the ordinary principles which guide the practice in regard to them proceeding from other causes. In affections of the skin and throat, it is much better to abstain from mercury altogether, and either trust entirely to local means, together with a suitable regimen, or employ iodine in some of the forms in which it is usually prescribed. In affections of the periosteum or bones, which, as already mentioned, never occur in a severe form except when the patient has suffered from the mercurial influence, iodine is also found eminently useful, the appropriate local treatment, and especially the regulated application of blisters, being at the same time employed. Should it fail in affording relief, corrosive sublimate may be administered, in very small doses, such as the eighth or sixteenth of a grain two or three times a day, given either solid or in solution, and combined with some anodyne or diaphoretic vehicle. If mercury were never used improperly, the treatment of venereal diseases, both primary and secondary, would be very easy; and as its abuse is every day becoming less common, there is reason to hope that the formidable class of mercurial diseases, on which volumes have been written, and particularly ulcers of this origin on the genitals, skin, mouth, and throat, will soon cease to be met with in practice. In regard to them it will be sufficient to state at present, that time, careful attention to the general health, and for local applications, the nitrate of silver, sulphate of copper, and the black-wash, are in general the best remedies. When the obstinacy of the sore is excessive, it may be necessary to destroy the surface by caustic potass.

Bubo.

The irritation of a sore on the genitals, of whatever kind, or wherever situated, especially if aggravated by exercise or intemperance, is very apt to occasion swelling and inflammation of the inguinal glands. The buboes thus produced differ in no respect, so far as regards their treatment, from those which owe their origin to other sources; and an erroneous opinion, that formerly led to the most mischievous consequences, namely, that, when caused by chancres, they were tainted with the syphilitic poison, and required a course of mercury for their removal, is now hap-

pily exploded. The mercury which, under this idea, used to be constantly prescribed in their treatment, by exciting fever and increasing the irritability of the system, often occasioned the most destructive phagedenic or sloughing effects, and, when less obviously injurious, rendered the ulcers that resulted from the buboes extremely obstinate, and sometimes almost incurable.

Instead of thus encouraging the irritation, the object should be to soothe and allay it as much as possible. Whenever the patient begins to feel pain in his groins, he should desist from walking, assume the horizontal posture, and foment the parts, two or three times a day, with hot water. When swelling is perceived, leeches are usually applied; and certainly almost always with the effect, in the first instance, of lessening the tumor and diminishing the redness. But there seems to be good reason for thinking that the local abstraction of blood is apt to render the morbid process more slow and obstinate, so that the patient suffers much more than if the disease had not been thus retarded. Warm fomentations, cathartics, and, above all, healing of the sores, are the most effectual means for resolving the inflammation; while, if suppuration does take place, these means are conducive to its speedy and perfect accomplishment. If the swelling proves very indolent, blisters are often very useful in effecting discussion, or hastening suppuration if it is in progress; and it not unfrequently happens that these means excite absorption of the pus even after it is distinctly perceptible by fluctuation, which is always very desirable, as a breach of the integuments ought, if possible, to be avoided in persons whose sluggishness of local action indicates a bad constitution. When the matter is fully formed, it should be evacuated by free incision, after which the cavity may be poulticed for a few days, and then dressed with a metallic wash. Should the surface present an unsound appearance, caustic potass ought to be employed for its destruction. If the glandular structure protrudes through the aperture, or rises above the bottom of the cavity in spongy-looking, ash-colored masses, it may either be subjected to the action of caustic, or first be removed in part by the knife or scissors. Should sinuses exist, owing to the aperture being too small or unfavorably situated, they are to be laid fairly open, or blistered if deep. In patients of feeble constitution, starvation and confinement are often the sources of obstinacy in

the resulting ulcer, and must be obviated by an alteration of regimen. If the system has been injured by mercury, recovery is sometimes rendered extremely tedious. In such cases, the gradual restoration of healthy action, which takes place through time, and the use of iodine with cod-liver oil, together with the external application of blisters, caustic, black-wash, or sulphate of zinc lotion, may be confided in as the best means of promoting recovery. When buboes present a phagedenic or sloughing character, they must be treated on the same principles as sores of the penis in similar circumstances.

Phymosis.

By Phymosis is understood a condition of the prepuce in which it cannot be drawn back so as to expose the glans. This condition may be either permanent or temporary; in the former case depending on the small size of the orifice, and in the latter resulting from swelling of the prepuce or parts contained within it. Permanent narrowness of the opening may be either congenital, or caused by the contraction that occurs during the cicatrization of ulcers. It is inconvenient on many accounts; and, in particular, exposes the individual to an aggravated form of all the diseases which affect the parts concerned. The temporary phymosis is a very common consequence of gonorrhœa, sores on the inner surface of the prepuce, and warts. The swelling is attended with redness and pain, and is not only distressing in this way, but reacts on the disease which occasioned it, and renders the symptoms more severe as well as the treatment more difficult.

The treatment of permanent phymosis requires dilatation of the orifice by incision, and this may be effected in various ways. Circumcision, or the removal of the prepuce with the knife or scissors, is easily performed, but deprives the glans of its covering. It sometimes happens, particularly in advanced age, that the prepuce becomes greatly elongated, thickened, and hardened, and then this mode of proceeding is the best, indeed the only one practicable. The ordinary plan is to slit open the prepuce, simply inserting one stitch at the termination of the incision to prevent separation of the cut edges, but this method also exposes the glans, and leaves redundant flaps of skin, which are apt to prove

troublesome. The best operation, on the whole, seems to consist in cutting off a circular ring-like portion from the extremity of the prepuce, drawing back the loose external skin, then slitting the internal membrane, on one or both sides, nearly as far back as the neck of the glans, and, lastly, stitching its cut edge to that of the skin. In cases of slight contraction, instead of removing any part of the prepuce, it is sufficient to divide the internal membrane so far as may be necessary by repeated snips of the scissors while it is exposed by drawing back the skin, and then stitching together the cut edges.

The temporary form of this disease requires soothing measures, to allay the inflammation on which it immediately depends. Rest, hot fomentations, and, if the symptoms are very acute, general depletion, together with leeches or scarifications, are the most effectual means for this purpose. If sores exist, they must be treated according to the principles already explained; and the operation for phymosis ought to be avoided if possible, even though the contraction may have existed in a permanent form previous to their production. In this case the prepuce should be restored to its ordinary state before being laid open, as the cure will thus be completed in a few days instead of weeks, which would probably be required if the incision were made during the diseased condition of the parts. Nevertheless if the sores prove very obstinate or irritable, this inconvenience must be encountered; but a careful and patient trial should always in the first instance be given to those means that are calculated to supersede the necessity of an operation. When the phymosis depends upon or is connected with warts, the prepuce should without delay be slit open, as these excrescences cannot be removed so long as it remains contracted. It sometimes happens, in consequence of phymosis being associated with an ulcerated state of the respective surfaces of the glans and prepuce, that adhesion takes place between them. Attempts have been made to remedy this preternatural connection by dissection and careful interposition of dressings; but this procedure, which is extremely painful, hardly does any good, as the strong tendency to contract during cicatrization reduces the parts nearly to the same state in which they were previously to the operation. In such cases, however, it is found advantageous to slit open the prepuce as far as it is not adherent to the glans.

Paraphymosis.

In Paraphymosis the orifice of the prepuce is drawn back behind the glans, and causes compression or strangulation of its neck. This can happen only where the opening is narrow, without being so much so as to occasion complete phymosis. The narrowest part of the prepuce is just at the orifice, where the skin and mucous membrane meet; and when it is drawn back so as to denude the glans, the internal lining is apt to protrude more or less beyond the ring thus formed, so that the seat of the stricture is not exactly behind the neck of the glans, but separated from it by a circular swelling caused by distention of the protruded internal membrane. A penis suffering from paraphymosis thus presents anteriorly the point of the glans in a tumid state,—then a circular swelling of mucous membrane,—next a deep sulcus, at the bottom of which is seated the stricture, formed by the narrow orifice of the prepuce,—and, lastly, the integuments of the penis more or less swollen. Paraphymosis occurs at all ages, but most frequently in boys. It is readily recognized by the appearances which have been described, and the symptoms it occasions by impeding the circulation. These are, in addition to the swelling, pain and other indications of inflammation, which, in circumstances favorable to intensity of action, may terminate in sloughing, but more frequently proves its own cure, by inducing ulceration at the seat of stricture.

The treatment obviously requires the use of means proper for effecting reduction of the strictured glans, and the manipulation for this purpose should be conducted on the same principles as those of the taxis for hernia. The surgeon having anointed the glans with oil, embraces it between the points of the thumb and fingers of his right hand, while with those of the left he makes counter-pressure on the constricting ring. He gently but steadily compresses it for some minutes, and then, by a combination of pushing and rotation, endeavors to press its neck within the stricture. If this proceeding fails, which it very seldom does when properly executed, he separates the swellings on each side of the stricture by bending down the extremity of the penis, so as to bring the tense cord-like portion of the skin which constitutes

it into view; and then, with a sharp-pointed curved knife, makes a small incision at this part, about a line in length and depth. The reduction is now readily effected, unless the parts should have become consolidated by adhesive effusion, in consequence of the disease having been permitted to exist a number of days or weeks, in which case, just as in hernial protrusions that prove irreducible after the stricture has been divided, the completion of the operation must be trusted to the gradual effects of that tendency to reparation which is exerted by the system. The penis should be enveloped in lint moistened with acetate of lead lotion, and the patient ought to maintain the horizontal posture until the parts resume their natural condition.

Cancer of the Penis.

The penis is frequently the seat of cancer. Ulcers on it often assume the most alarming appearance, and exhibit extreme indisposition to heal, in consequence of constitutional peculiarities, especially that induced by the prejudicial use of mercury; but such sores should be carefully distinguished from those of a truly carcinomatous nature. The latter are met with in persons of advanced age. They are characterized by the inequality of their surface, the cartilaginous hardness of their base, their fetid discharge, and lancinating pain. The inguinal and iliac glands become affected in the progress of the disease, and the patient dies hectic from continued irritation.

The only remedy that affords any prospect of a radical cure is removal of the morbid part, and this, of course, only when the glands are untainted. The operation, therefore, ought to be performed without delay, so soon as the disease is distinctly recognized to be of this malignant kind. The penis may be amputated without any ceremony,—care only being taken that the whole of the disease is removed, together with a portion of the neighboring sound tissues. The integuments are more apt to prove redundant than defective, and therefore need not be saved by drawing them back previous to division. The arteries that require ligatures are to be tied, and the oozing of blood may be restrained by the application of cold water, or by effecting pressure on the stump after a flexible catheter has been introduced into the bladder.

Lest the orifice of the urethra should contract during the cure, a bougie must be introduced occasionally to preserve its proper width.

DISEASES OF THE TESTICLE.

Inflammation, or Hernia Humoralis.

The Testicle is excited to inflame by a variety of circumstances, of which the most important, in respect to their frequency, are bruises, wounds, gonorrhœal inflammation, either spreading back along the continuous surface between the urethra and testicle, or suddenly suffering a metastasis to the latter situation, and the irritation proceeding from strictures, or the means employed to cure them. The symptoms are pain, hardness, and swelling, with more or less redness; and in acute cases, there is not only feverish disturbance of the system, but also sickness, vomiting, and constipation, similar to those attending strangulated hernia, in consequence of the testicle being connected, in its sympathies, with the viscera of the abdomen. When the inflammation is intense, it may prove fatal; but, in general, it is merely productive of temporary distress, and exposes the patient to the risk of serous effusion, chronic enlargement, and alteration of structure, which are frequently its consequences. The most violent cases met with are those caused by wounds of the gland; and such injuries are, therefore, regarded as dangerous, particularly in irritable constitutions.

The treatment of inflamed testicle must be regulated by the circumstances of the case. If there is redness of the skin, and other indications of acute action, blood should be abstracted locally, either by applying leeches or by opening some of the veins of the scrotum with a lancet. If the latter mode is chosen, the patient should stand erect while the veins are punctured, and as long as it is desired that the blood should flow. Warm fomentations applied to the scrotum, emollient injections thrown into the rectum, occasional doses of castor oil, and a strict antiphlogistic regimen are the other means of most use, and, when the symptoms are very severe, should all be administered, together with opiates, to allay the tendency to excessive action. In mild cases it is generally sufficient to evacuate the bowels freely, enjoin rest in the

horizontal posture, and apply a lotion of acetate of lead with opium to the scrotum. After the pain and tenderness have subsided a degree of swelling frequently remains, for which discutient applications should be employed, but with due caution, so as not to occasion a relapse by producing too much irritation.

Hydrocele.

By Hydrocele is understood an accumulation of serous fluid in the cavity of the *tunica vaginalis*, or confined to the part covering the spermatic cord. In the former case, which is by far the most common, the swelling has generally a pyramidal figure, the large extremity being downward,—is devoid of pain and sensibility, except at the lower and back part where the testicle lies,—appears translucent when placed between the eye and a candle in a dark chamber,—and is felt to fluctuate when pressed between the fingers alternately. In hydroceles of old standing and large size, the *tunica vaginalis* often becomes distended to an equal size quite up to the external ring, and so thickened that no translucency can be perceived. The fluctuation, insensibility to pressure except in the region of the testicle, and the history of the case are then the only diagnostics from a swelling of the gland; and, if they should leave any doubt, it may be removed by a puncture. From hernia, hydrocele may always be distinguished by compressing the neck of the tumor between the fingers. In hydrocele of the cord, as collections of fluid in this situation are named, the swelling is usually round or oval, fluctuating, and translucent, leaving the testicle quite distinct, so that it may be felt on all sides. It is sometimes associated with the other form of the disease, and can then hardly be recognized except by evacuating one or other of the sacs. The title of Spermatocele has been applied to hydrocele of the cord when its contents are colorless, slightly opalescent, and present numerous spermatozoa under the microscope. It was thought that this character denoted a form of the disease not amenable to the ordinary treatment, but I have ascertained that there is no good ground for such a distinction, though it is true that, as the swelling is generally of a small size, and little disposed to increase, there is seldom much occasion for interference.

The origin of hydrocele may sometimes be referred to blows or other sources of irritation, but is in general very obscure. The existence of a predisposition to the disease is rendered probable by the fact that the fluid sometimes collects first on one side, and then, perhaps after an interval of years, appears on the other. The complaint generally commences about middle age, but is met with at all periods of life. Infants sometimes labor under it, either in consequence of the *tunica vaginalis* continuing to communicate with the cavity of the abdomen, and allowing fluid effused there to descend into it—a condition that has also, though very rarely, been observed in the adult—or simply effusion from some source of irritation often not observable.

The treatment of the disease is either palliative or radical. The former consists in merely drawing off the fluid; the latter in doing so, and at the same time preventing its reaccumulation. The tapping of a hydrocele is best performed with a small trocar, which should be introduced at the anterior surface, about a third of the length of the tumor from the bottom, and at an equal distance from both sides. There is here least risk of wounding any large vessels, and the greatest separation of the *tunica vaginalis* from the testicle, to avoid which more effectually the instrument ought to be pushed gently and steadily through the parietes of the swelling, while they are held tight with the left hand embracing it, and directed not perpendicularly to the surface, but obliquely upward. But as the testicle is not by any means constant in its position relatively to the swelling, and as the *tunica vaginalis* is liable to partial thickenings, which would very much oppose the free introduction of the trocar, the operator should never proceed to puncture until he has examined the parts and satisfied himself that there is no obstacle in the way of the instrument. This simple operation is proper in cases where it is not certain that the water will be again collected, and when the state of the patient's constitution, from age or other circumstances, renders it imprudent to excite any more than the most gentle irritation. It ought always to be performed before the radical cure is attempted, when the swelling is very large, or when it is necessary to ascertain, by examining more accurately than can be done while the water still remains, that the condition of the testicle is not opposed to the success of the operation required for this purpose.

Various methods have been employed for effecting the permanent cure of hydrocele. Of these the following may be mentioned: Incision, Excision, Caustic, Seton, and Injection. The last of these is now almost universally preferred, and it will, therefore, be sufficient to notice the others very shortly. Incision, which is the most ancient practice, consisted in laying the cavity of the distended *tunica vaginalis* freely open, and inducing its obliteration by the granulating process. Inflammation and constitutional disturbance were the necessary consequences of this operation, and not unfrequently proved so violent as to occasion gangrene and death. The plan of Excision, though of very old origin, was chiefly practiced in the latter part of the last century. It consisted in cutting away an elliptical portion of the integuments, together with the whole of the *tunica vaginalis*, where not adherent to the testicle and cord. This operation, though more tedious and painful in its execution than the former, occasioned less severe consequences, and was followed by a more speedy cure, owing to the serous tissue being in great part removed. The Caustic was applied in the same way as for making an issue. The aperture caused by it could not of course heal by the first intention, and necessarily excited suppuration of the whole surface, which then gradually contracted like that of an ordinary abscess. This practice was employed during the last century, though not unfrequently attended with serious accidents in irritable constitutions. The Seton was applied to this purpose by Guy de Chauliac, in the fourteenth century, and is mentioned by Fallopius, Paré, and others, but was never very extensively used, either then or in more recent times. Pott strongly recommended it, and has given a very particular description of the mode of performing the operation. The essential part of it is the introduction of a skein of silk, or cotton, through the parietes of the swelling in its long direction. Inflammation and suppuration follow, and at the end of a fortnight the seton being withdrawn, the cure is soon completed. Notwithstanding all the precautions that can be used, the irritation thus excited sometimes occasions an alarming degree of inflammation, and even in the most successful cases a long and irksome confinement is required. The treatment by Injection was first employed by the surgeon of a Scotch regiment, named Munro, in the early part of last century. Various trials of it

were made in this and other countries, particularly by Sabatier of Paris; but Sir J. Earle had the merit of introducing it into British practice. The object of the operation is to excite a degree of inflammation, sufficient to occasion such a change in the state of the parts concerned as may prevent the water from returning. An endless variety of fluids have been employed for this purpose, but port wine, solution of sulphate of zinc, and cold water have been chiefly used until lately, when the tincture of iodine has come to supersede all the others. There is some difference of opinion as to the mode in which irritating fluids, injected into the *tunica vaginalis*, act in radically curing the disease. Some have alleged that the respective serous surfaces become firmly united, in consequence of an effusion of lymph from them; and others maintain that there is merely a change produced in the secreting action of the vessels, which prevents the fluid from reaccumulating, though the cavity remains as perfect as ever. It is probable that the truth lies between these two opinions, and that, though union of the adjacent surfaces is not essential to the cure, adhesions generally do take place.

The apparatus required for the operation is a small trocar, and a syringe capable of containing a quarter of an ounce. The trocar having been introduced as for the palliative cure, the canula should be pressed in a little further, to insure its conveying the injection fairly into the cavity of the *tunica vaginalis*. The fluid is then thrown in and allowed to remain. Pain stretching up along the groin toward the loins, and occasionally slight nausea, are in general experienced during the operation. After it is concluded the patient goes to bed, and seldom feels much inconvenience from what has been done until the following day, when the testicle swells, and more or less fluid is effused into the vaginal cavity. A slight degree of constitutional disturbance keeps pace with these local changes, and both are usually at their height on the third day. The swelling then begins to lessen, the feverish state subsides, and the patient is able in a few days to resume his ordinary occupation, though several weeks generally elapse before the swelling is completely dispersed. It is observed that the more solid the swelling consequent upon the operation is, the more speedy and complete is the cure.

The hydrocele of children does not require the radical opera-

tion, as the fluid is readily absorbed under the influence of a discutient lotion, such as a solution of muriate of ammonia with spirits and vinegar, or, at all events, seldom returns if such a lotion be applied after evacuation by a trocar or lancet.

Hæmatocele.

The *tunica vaginalis* is sometimes distended with fluid not clear and serous-looking, but of a dark-brown color, and when allowed to remain at rest after being drawn off, depositing a layer of florid blood; while the cavity, if laid open, is generally found to contain more or less fibrinous coagulum, partly detached, partly adherent to the sides of the sac. The disease is then named Hæmatocele. It is recognized by the characters of hydrocele, with the exception of translucency, which is altogether absent; but, as this feature may depend on unusual thickness of the sac, the only certain diagnostic is obtained by puncturing the tumor. Hæmatocele is sometimes associated with diseases of the testicle. The origin of the blood which constitutes it is involved in great obscurity, but, on the whole, seems to be ascribed with most probability to hemorrhage from the vessels of the *tunica vaginalis*. The disease is almost always a hydrocele in the first instance, and the history usually given of it is, that after the ordinary serous fluid had been drawn off the swelling returned very rapidly, and upon being tapped again was found to be filled with the dark-colored contents above described. In cases of old standing, numerous small scales are observed floating in the fluid, and these when collected are ascertained to consist of cholesterine. Dr. Bostock has suggested, with apparent probability, that they are not the direct result of secretion, but the product of a chemical change taking place in the effused fluid, similar to that by which adipocire is formed from flesh when subjected to long maceration in water. The same sort of scales are found in old collections of albuminous fluid in other parts of the body, and no doubt proceed from the same source. The *tunica vaginalis* is always very much thickened, sometimes of almost cartilaginous hardness throughout, and occasionally soft and pulpy on its inner surface. I minutely injected the vessels of a hæmatocele which had been ascertained, by a puncture previously, to be still capable of reproducing the bloody

contents, but did not find the slightest extravasation or appearance of rupture, either from disease or injury.

The remedy of hæmatocele, as of hydrocele, may sometimes be accomplished by the injection of iodine; but in general thick and diseased *tunica vaginalis* requires to be laid freely open, or removed in part if very large. The wound should be dressed with dry lint after the vessels have been tied. Considerable constitutional disturbance may be expected; but, under proper treatment, it seldom proves excessive. Suppuration being induced, the granulating process soon brings the sides of the wound together and completes the cure.

Cirsocele.

The veins of the testicle, which enter into the formation of the spermatic cord, are subject to varicose enlargement, particularly on the left side. The vessels become greatly dilated, thickened in their coats, and extremely tortuous. There is thus caused a swelling, which alarms the patient, occasions a dragging uneasy feeling in the groin and back, aggravated by standing or walking, and is itself also sometimes the seat of disagreeable sensations. When the dilatation occurs high in the cord, near the external ring, it sometimes bears a great resemblance to inguinal hernia. In order to distinguish between the two diseases, the patient is generally laid in the horizontal posture, when the swelling disappears, whether of the one kind or the other. Pressure is then made at the ring, and the patient rises, when the swelling will reappear if depending upon vascular enlargement, as the blood cannot thus be prevented from finding its way through the arteries, but the tumor will not return if of a hernial nature. This test, though often decisive, is frequently ambiguous; and it seems a more certain means of ascertaining the truth to compress the neck of the swelling while the patient stands erect, when, if composed of dilated veins, *it will become more tense.* The same diagnosis is applicable for the recognition of swellings in this situation dependent upon serous effusion between the vessels composing the spermatic cord, which is not unfrequently met with in children and is apt to be mistaken for hernia. Cirsocele is met with chiefly in young men between twenty and thirty, but frequently occurs soon after puberty. It exists in very various degrees of size, and

occasions more or less inconvenience accordingly. It does not seem to interfere with the functions of the testicle.

The circumstances which determine the commencement of the disease have not been ascertained. It is certainly more common in persons who have indulged in venereal excesses, but often exists quite unconnected with any such habits. It tends to increase to a certain extent, and then either remains stationary or diminishes. The patient is generally rendered very anxious by the complaint; but the small inconvenience which attends it does not warrant any very severe measures for its relief. Washing with cold water completely removes the swelling for a time, by corrugating the scrotum and bracing up the testicle to the pubis. A suspensory bandage effects this more permanently, though not so efficiently; and an open state of the bowels, with rest in the horizontal posture, contributes to keep the disease within bounds. The means of radical cure consist in extirpation of the testicle, which can hardly, if ever, be warrantable;—ligature or transfixion of the veins, which is dangerous and useless;—the pressure of a spring truss, which is absurd in theory and hurtful in practice;—and excision of the redundant scrotum.

Chronic Enlargement of the Testicle.

The testicle is very liable to simple enlargement, with hardening, which produces uneasiness from the bulk and weight attending it, and no doubt impairs the action of the gland; but is seldom painful or very sensible of external impressions. It is generally irregular on the surface, and dense in its structure. The circumstances which most frequently give rise to this condition are attacks of inflammation, especially when repeated or badly treated, and chronic irritation of the urethra from stricture or other causes. In commencing the treatment, the first step should always be to examine the state of the urethra by passing a moderate-sized bougie, and if it either meets with obstruction or causes more than usual pain, thus indicating a morbid sensibility of the lining membrane, the operation must be repeated with instruments varied according to the nature and peculiarities of the case, until there is no longer any trace of disease. Even when the urethra seems to be sound, advantage is occasionally derived from the use of

bougies, and in a week or two, or sometimes in a few days, very formidable-looking tumors may thus be discussed. Should the swelling exist along with a sound state of the urethra, or resist this treatment, means of promoting absorption must be employed. With this view the patient should maintain the horizontal posture, use a very spare diet, and be subjected to a gentle course of mercury; at the same time having the absorbent actions of the part excited by leeching and discutient lotions, which answer better than blisters or ointments. If there is water in the *tunica vaginalis*, a complication named Hydro-Sarcocele, the fluid ought to be evacuated by puncture before these local measures are instituted. When the swelling attains a large size, and resists a patient trial of the means that have been mentioned, it may be removed by the knife as a last resource, and of course with a favorable prognosis in regard to the prospect of permanent recovery. A section of the tumor removed in such cases generally exhibits a compact fibrous structure, which is usually of a yellow or yellowish-gray color, and contains irregularly-sized cells interspersed through its substance.

Cystic Sarcoma of the Testicle.

The testicle is liable to the formation of cysts in its texture, and these sometimes occupy so much of it as to constitute a mass in which the cystic character predominates. When this disease is associated with hydrocele or hæmatocele, its diagnosis cannot be made out with accuracy, until the fluid in the *tunica vaginalis* has been drawn off. The only remedy for this affection is removal, and the operation may be performed with less regret, as the glandular structure of the testicle always suffers such atrophy, or changes in its texture, that it cannot be expected to perform its function.

Medullary Sarcoma of the Testicle.

Excepting the bones and the mamma, the testicle is perhaps more subject to the derangement of nutrition, which leads to this morbid growth, than any structure in the body. It is generally met with at and before the middle period of life; sometimes com-

mencing without any assignable cause, but not unfrequently being referred to blows or bruises, or to inflammation excited by other means. The patient's appearance is generally healthy, and the diseased action shows less tendency to spread than when it occurs in other parts. The tumor merely enlarges, becoming very irregular and tuberous on the surface, and exhausts the patient by the irritation which the pain attending it occasions; but the integuments and glands are extremely slow in acquiring the morbid disposition, so that the operation of removal, which, of course, affords the only means of relief, is performed even in very advanced cases with a favorable prognosis. In the earlier stage of the growth it is often found very difficult to determine positively, by external examination, whether the swelling is solid or depends on the presence of fluid. The globular shape, tendency to tuberous projections of the surface, pain, and equality of consistence at all parts of the tumor, observed when it is solid, may generally render the discrimination precise; but in cases of doubt, the truth can readily be discovered by making a puncture, which can do no harm if the patient is prepared to submit to extirpation of the testicle in the event of its proving necessary. The tumor, when divided, displays the characters peculiar to such degenerations, namely, a soft brain-like pulpy substance, irregularly partitioned by thin septa of cellular texture, and varying in color from white to dark-red, according to the proportion of blood which enters into the composition of the mass.

Suppuration and Fungus of the Testicle.

Young men of scrofulous constitutions are liable to abscesses and sinuses of the testicle, which are apt to prove very obstinate, even when they are freely dilated by incision. It might seem in such cases that extirpation would be a simpler, much speedier, and hardly more injurious mode of relief, than thus laying open the structure of the gland by dividing it in various directions; but if the cure is completed, very little trace of these incisions remains, and the organ may perhaps be still capable of performing its office. It occasionally happens after suppuration has taken place in the testicle, particularly when induced by the cachectic state caused by mercury and preceded by hardness, and the re-

sulting matter has been discharged, that a fungous excrescence protrudes from the opening, presenting a very formidable appearance, which formerly led to removal of the organ as affected with malignant disease. Mr. Lawrence pointed out the true nature of these productions, and explained that they depended not upon the peculiarity of action, but on the peculiarity of structure, which, being soft and inclosed in a firm capsule, tended to expand when the coverings were perforated so as to permit its doing so. He ascertained that if the excrescence were cut off or destroyed by caustic, the remaining surface granulated; and, though it might repeatedly protrude again to a smaller extent, that ultimately, through a repetition of the same means, followed by pressure, it became completely cicatrized.

As the fungus, from its constitution, admitted of being considered similar to an extreme degree of exuberant granulation, it occurred to me that the disease might be induced by pressure to retrace its steps, and thus permit recovery without any loss of substance. For this purpose, nothing seemed so convenient as covering the growth with the scrotal integuments, which being freely separated by dissection from their subjacent connections, could be readily brought over the tumor so as to have their edges united by sutures. This experiment proved eminently successful, and has been followed by results in the practice of others, as well as myself, which warrant me to recommend the operation as in every respect deserving of confidence. It may now, through the agency of chloroform, be performed without pain. It is much more speedy in effecting recovery than any other method, and it preserves instead of destroying the organ concerned.

Extirpation of the Testicle.

The mode of removing the testicle, whatever be the circumstances requiring the operation, is to be conducted on the same principles, which may now be explained. The points of most importance in determining these are—1. The quantity of integument to be left; 2. The suppression of the bleeding; and 3. The dressing of the wound.

When the tumor is large and of rapid growth, the skin covering it is not only put very much upon the stretch, but also bor-

rowed from that of the penis and the other testicle; consequently, if the whole of it were taken away, a very large exposed surface would remain. If, on the other hand, none of the integuments, or only a small portion of them, were removed, more especially in a case of slow and long-continued swelling, though the corrugating effects of the contractility of the scrotum, excited by the irritation of the operation, might, in the first instance, make it appear that no inconvenience was likely to result, the redundant integument would certainly, so soon as it became relaxed, afford an ample receptacle for the accumulation of blood or pus, and present a very extensive granulating surface, that must greatly prolong the cure. Keeping these different considerations in view, the surgeon should endeavor to preserve merely enough of the integuments to allow the edges of the wound to be brought together without either straining or laxity. In regard to the hemorrhage, great apprehension has been entertained lest the cord should be retracted by the cremaster muscle, and the artery withdrawn beyond reach of the ligature. This has led to many coarse and dangerous expedients, such as tying the whole cord previous to its division, or including all its vessels together except the *vas deferens*. Violent pain, fever, inflammation, convulsions, and even death were the consequences of this practice, which is now abandoned, the artery being tied alone; but the fear of retraction still excites uneasiness during the operation. It, therefore, seems necessary to remark, that, as the cremaster muscle is attached very near the external ring, it cannot withdraw the cord except to a very small extent, and that, if the artery retires at all, it must do so in consequence of its own elasticity. Retraction on this account may be expected in proportion to the size of the tumor, the rapidity of its growth, and the nearness to the external ring, of the point at which the cord is divided. In no case, however, will it be necessary to use any force in retaining the vessel, and the assistant may readily secure it either between the nails of his thumb and fore-finger, or with forceps. Besides the spermatic artery, there are always several, and sometimes so many as seven or eight vessels coming from the groin and perineum, that require to be tied.

Such being the principles to be followed in performing the operation, it may now be right to explain succinctly the mode of

proceeding. The patient should be laid reclining on a table or sofa, with the thighs separated, and the hair of the pubis shaved off. The surgeon then, grasping the testicle in his left hand, makes two incisions, commencing at the external ring, and uniting at the bottom of the tumor. He next cuts down to the cord, where these incisions meet above, passes his finger under the vessels, and then desires the assistant to lay hold of them. He now divides the cord as low as is consistent with entire removal of the disease, and pulling the lower end of it toward him, turns out the testicle, which may be detached with a few strokes of the knife, while the penis and sound testicle are drawn aside. The spermatic artery, and any branches of the perineal or inguinal vessels that threaten to bleed, are then tied, and lint is applied to afford the requisite support.

Sarcomatous Enlargement of the Scrotum.

The scrotum is liable to an enlargement, which seems to consist merely in a morbid growth of the cellular substance, with interstitial deposition of albuminous matter, so as to give it a very firm consistence. When exposed by a section, the structure appears white, compact, and homogeneous, except where small cells containing glairy fluid are interspersed through it. The growth begins in the lower part of the scrotum, but, as it proceeds, engages the whole of it, together with the skin of the penis, which becomes completely concealed from view. The prepuce is greatly elongated, and presents at its orifice a tuberculated cauliflower-looking excrescence, that does not bear the slightest resemblance to the part in its natural state. There are no limits to the size which such tumors may attain. Twenty, forty, or even sixty pounds' weight is by no means uncommon; and there is one case on record in which the mass when removed weighed 170 pounds. The disease generally commences in adults, and increases slowly during the remainder of life. It is common in tropical countries, particularly in the West Indies, but occurs comparatively seldom in the temperate climates of Europe.

The only remedy for this oppressive growth, which impedes progressive motion, and occasions other serious inconveniences, consists in its removal. This object has been attained without

taking away the penis and testicles; but the former of these organs is so deeply imbedded in the substance of the tumor, and its texture is usually so vascular, that such a procedure cannot always be practicable. If an attempt is made to preserve the sexual parts, flaps of the integuments must be preserved of sufficient size to cover them. Should, on the contrary, the removal of the entire tumor be determined on, the incisions may be executed with great rapidity, which mode of conducting the operation is much safer than cutting slowly, with the view of securing the arteries as they are divided; for both the pain and hemorrhage are thus greatly increased, and the patient, instead of being relieved from his load in a few seconds, may be detained under the knife for hours.

The labium of the female is occasionally the seat of a similar growth. It possesses the same structure, gives rise to similar inconvenience, and admits of no other remedy.

Cancer of the Scrotum.

Mr. Pott (1775) described a cancerous ulceration of the scrotum, which he had frequently remarked in adult chimney-sweepers. Succeeding surgeons have confirmed the accuracy of his observations, so far as London is concerned; but in Edinburgh, and other parts of Scotland, this chimney-sweeper's cancer is hardly ever met with, except in persons who have begun to suffer from it elsewhere. The following is the description of Mr. Pott: "It is a disease which always makes its first attack on, and its first appearance in, the inferior part of the scrotum, where it produces a superficial, painful, ragged, ill-looking sore, with hard and rising edges. The trade call it the *soot wart*. In no great length of time it pervades the skin, dartos, and membranes of the scrotum, and seizes the testicle, which it enlarges, hardens, and renders truly and thoroughly distempered, from whence it makes its way up the spermatic process into the abdomen, most frequently indurating and spoiling the inguinal glands. When arrived within the abdomen, it affects some of the viscera, and then very soon becomes painfully destructive."

The only remedy for this disease is removal of the cancerous part; and, unless the operation be performed before the morbid

process has advanced far, it does not afford any chance of a permanent cure.

DISEASES OF THE FEMALE ORGANS OF GENERATION.

The vagina is sometimes more or less completely obstructed by a membrane at its orifice, which opposes the exit of the menstrual discharge. The non-appearance of the menses at the usual period of life, or the symptoms connected with their retention, should always lead to an inquiry respecting the conformation of the parts, and if such a congenital imperfection as the one just mentioned is discovered, the patient may be completely relieved by a very simple operation; all that is necessary being to divide the membrane with a knife or scissors, and interpose a piece of lint between its cut edges. The vagina, in some rare cases, has been found altogether wanting for part of its extent, in which cases, of course, nothing can be done in the way of remedy.

The Uterus is subject to the development in its substance of simple sarcomatous tumors of a very firm fibrous structure, which often grow from different parts of the organ at the same time, and, though generally not exceeding the size of an egg, are sometimes so large as to distend the abdomen far beyond the limits of an ordinary pregnancy. Iodine and other medicines are prescribed, both locally and internally, with the view of promoting the discussion of such growths; but it is probable that nothing can have any beneficial effect upon their progress except attention to the mode of life, which should be of a kind calculated to excite as little as possible the system in general, and the uterus in particular.

Cancer of the uterus occurs occasionally, but is fortunately not frequent, since the situation and connections of the parts affected prevent the only effectual remedy for carcinomatous disease from being put in practice without inflicting a mortal injury. A few cases are recorded in which the uterus is said to have been extirpated when previously prolapsed beyond the orifice of the vagina, and permanently retained in this situation by the adhesions resulting from inflammation. It is only in such circumstances that the operation ought ever to be contemplated, and even here it must be regarded as affording a very small chance of success, so that,

unless the patient's sufferings are very great, and threaten to terminate fatally soon, it could hardly be recommended with propriety.

The uterus may be extirpated more safely, when it is in the state named Inversion by accoucheurs. It is in this case turned inside out, so as to form a round or pyriform tumor, either confined to the vagina, or protruded beyond the vulva. When this eversion, which generally takes place at the time of delivery, is not immediately remedied, it is apt to become irreducible; and the patient suffers many disagreeable symptoms from the unnatural condition of the organ, especially frequent hemorrhage, down-bearing pains, and general weakness. In cases that resist more gentle means, the tumor may be removed by ligature, which should be of strong twine or silk; and either applied simply round its neck, or carried through the middle of it double by means of a needle, one of the threads being then tied on each side. If disagreeable effects ensue, opiate injections into the rectum, and the hip-bath, will be the most efficient measures for affording relief.

Polypous excrescences frequently grow from the inner surface of the uterus, and either remain confined to its cavity or descend into the vagina, sometimes even protruding externally. These tumors have a pyriform shape and a firm consistence. They possess little sensibility, but much vascularity, and occasion many unpleasant symptoms, such as bloody and mucous discharges, pain in the back, weakness, emaciation, and general bad health. They cannot be either positively recognized, or removed, unless they extend below the *os uteri*, or have access afforded to them by dilatation of the orifice. If they cannot be brought into view, the best mode of removing them is to tie a strong ligature as close as possible to their root. This is executed much more easily by means of the fingers, than any of the apparatus contrived for the purpose. They may also be removed by evulsion. When the neck of the excrescence can be pulled beyond the orifice of the vagina, the simplest and speediest mode of proceeding is to transfix it with a needle, and carry through two threads, which are then tightly tied, one on each side, after which the tumor may be removed by the knife. There is often considerable difficulty in distinguishing growths of this kind from eversion of the uterus. Their history, deficient sensibility, and their having

round their root a ring formed by the *os uteri*, in general afford sufficient diagnostics on a careful examination.

Excrescences frequently grow from one or both lips of the *os uteri;* and by bleeding, or exciting the usual symptoms of uterine irritation, occasion great distress. It has been found by Lisfranc, and other French surgeons, that their excision may be performed without any bad consequences, and with the best effects, even when they have attained a very large size. The instruments employed for the purpose consist of hooked forceps to draw the morbid growth into view, and curved scissors or a bistoury to cut it away. The hemorrhage may generally be restrained by cold applications and plugging the vagina with lint or sponge; but if it should prove excessive, the cut surface must be again drawn out and compressed, by transfixing it with a couple of threads, and tying one on each side.

The Ovaries are liable to various morbid conditions, but particularly two, which often become the subject of surgical consideration. Of these, the first that may be mentioned consists in the development of cysts in their substance, which is thus converted into a cystic tumor. The swelling is at first felt round, firm, and movable in the inguinal region. It gradually increases, not owing to an equal enlargement of all the cysts, but an extension of one or more of them. The cavity of the abdomen is distended, and at length appears as if the peritoneum were the seat of dropsical effusion. The progress of the disease is very variable; sometimes proceeding rapidly to the extinction of life, by pressing to a fatal degree on the vital organs of the abdomen or chest, but more frequently allowing years to elapse before coming to this termination. The disease commences most frequently in young females, but is met with at all periods of life. It is distinguished in its advanced stage from ascites chiefly by the history of the case.

The treatment by paracentesis of Ovarian Dropsy, as this affection is called, proves still less satisfactory than that of dropsy of the peritoneum, which will not excite surprise, when it is recollected that the diseased action in the latter case is simply an increased secretion, while in the former it is a new and peculiar formation. Purgatives, diuretics, and all other means employed to promote absorption of the accumulated fluid almost invariably prove quite unavailing; and paracentesis, though it affords some

temporary relief, seems in general to hasten the progress of the disease. The operation, therefore, ought not to be performed, except when the patient is suffering great distress. Various methods of effecting a radical cure have been proposed. Of these the chief are, throwing injections into the sac, introducing a seton through it, and drawing it out of the abdomen by an aperture in the parietes. The one last mentioned, though apparently the most severe, on the whole seems to be the most expedient in cases warranting such interference.

The Ovaries are subject to enlargements of a solid kind, which not only occasion inconvenience by their size and weight, but are generally the seat of painful sensations. The structure of these tumors is generally of a complicated kind, displaying, when exposed by a section, the characters of vascular, fibrous, and cystic sarcoma, in variable proportion and distinctness. The disease is sometimes rapid in its progress, but usually slow, and often exists for years before giving much trouble. After attaining a certain extent, it sometimes remains stationary, and the patient becoming habituated to its presence, suffers comparatively little inconvenience. Iodine, leeches, and other means calculated to promote absorption or allay irritation are employed in such cases, but with hardly any perceptible advantage; and all that can be done by external measures, whether local or general, seems to be to retard the morbid process through the effect of diet and regimen. Excitement of every kind ought to be avoided; the secretions ought to be carefully maintained; and if any local means are used, they ought to be of a soothing kind, such as warm fomentations.

The inefficacy of medicine in remedying tumors of the ovaries has led to the trial of surgical operations for their removal. The objections to such a proposal are—1. The uncertainty that must always attend the diagnosis of the disease, which is often very closely simulated by distention of the bowels, thickening of the omentum, enlargement of the liver, and growths from the uterus; 2. The impossibility of ascertaining, before the abdomen is laid open, whether or no the connections of the tumor allow of its removal without the infliction of a mortal wound; 3. The danger of the operation even in the most favorable circumstances; and 4. The difficulty of knowing how long the patient may live if the

disease is not interfered with. Notwithstanding these serious obstacles to ovariotomy, and although until comparatively a recent period experience confirmed the worst anticipation of its effects, the operation has now become established in practice. The greater success which has led to this result appears attributable chiefly to—1. The more accurate discrimination of cases; 2. The use of silver sutures; 3. The care taken to prevent sanguineous or cystic effusion into the cavity of the peritoneum; and 4. The management of the pedicle, especially by attaching it to the lips of the wound.

CHAPTER XX.

BRAIN, SPINAL MARROW, AND NERVES.

Injuries of the Brain and its Coverings.

Concussion, or a violent shock, may act injuriously both on the brain and the parts which inclose it, either separately or together. It occasions at one time rupture or laceration, and at another merely disturbance in the vital action. In both cases it is apt to excite inflammation, and then, besides its primary effects, produces very important secondary ones.

Concussion of the brain is caused by blows on the head, or by falling in such a position as prevents the force of the shock from being diffused over a number of intermediate articulations before reaching the head. The effect of blows on the head in producing concussion is proportioned to their force, the flatness of the surface applied to the skull, and the resistance it makes. The symptoms of the injury vary with the degree of it. If there is no laceration of the cerebral substance or membranes, the patient merely suffers a temporary diminution or suspension of the functions of the organ. In very slight cases, there is confusion of ideas, and weakness of the voluntary muscles, which last only a few minutes. When the shock has been more severe, the patient is quite insensible; his pulse is small and irregular; his breathing

is slow and feeble; his pupils are fixed, generally in a contracted, but sometimes dilated state, and there is occasional vomiting. This condition seldom lasts beyond ten, or at the most twenty minutes, and is succeeded by a return to health, which either continues, or terminates in inflammation. When the concussion has caused laceration of the cerebral substance, the insensibility is of longer duration; and when at the end of some hours, or it may be a day or more, the patient begins to give signs of returning consciousness, he recovers very imperfectly, and only for a short interval before inflammation commences. In such cases, death often occurs within a few hours, or even a shorter period, after the accident, and before any signs of recovery from the insensible state can be perceived.

The treatment of concussion may be conveniently considered, in reference to the three stages of the consequences of the injury which have been mentioned, namely, that of the concussion properly—that of recovery—and that of inflammation. During the first of these, little or nothing ought to be done, except putting the patient to bed and applying some source of artificial heat to his feet if necessary. Bleeding would be decidedly improper; and the exhibition of internal stimulants, though it might hasten the recovery of sensibility, might also increase the violence of subsequent reaction. Unless, therefore, the signs of debility in the vital actions should be alarming, the patient may be trusted entirely to the powers of his constitution.

The second stage, or return of sensibility, requires more attention, since the treatment during this stage greatly influences the succeeding one. The patient is apt to suppose himself quite well, and to have fortunately made a very easy escape from the effects of his accident; but were he, in accordance with this belief, to expose himself to cold, or subject himself to the excitement of exercise or stimulating food and drink, he would increase the risk of inflammation, and aggravate its intensity beyond that which would otherwise have resulted from the injury. He ought, therefore, to be confined to the house, or to bed if the case is severe, and restricted to the most scrupulous antiphlogistic regimen for a few days. So far as the brain is directly concerned, he might safely resume his usual habits after this period of probation; but its coverings being apt to suffer, or perhaps, more correctly, to

show signs of the suffering at a more distant date, in consequence of the injury they have undergone, as will be explained hereafter, he should for several weeks at least be very abstinent, if the blow has been at all severe. The restoration of the sensorial faculties is sometimes only partial, and the patient then remains permanently defective in respect to some of them, particularly memory. Sometimes also the character or disposition of the individual is observed to be changed.

The symptoms of inflammation of the brain generally appear within from twelve to twenty-four hours after the injury has been sustained. The pulse becomes quickened and sharp in its stroke; the skin feels hot and dry; the patient is restless, complains of headache, and is unusually sensible to light and noise. If the disease proceeds, the indications of it just mentioned become more strongly marked. Delirium and spasmodic contractions of the muscles come on, and are soon succeeded by insensibility and palsy of the limbs, and death closes the scene in the course of a few days at furthest. On dissection, the brain or membranes are found very vascular, with purulent effusion on the surface of the latter, and softening of the substance of the former. In cases where the texture of the brain has been lacerated in the first instance, the state of insensibility and collapse which immediately follows the accident, after a period of variable length, from a few hours to twenty-four, gradually passes into that of inflammation, generally with the intervention of an imperfect return of sense and voluntary motion, which is apt to suggest delusive hopes of improvement. The patient expresses pain by restlessness and moaning, his limbs are rigid or convulsed, and in a short time he passes into the same condition as if the inflammation had originated from mere derangement of action, and not alteration of structure. On dissection, the cerebral substance at the injured part is found softened, and seeming as if mixed with blood and pus.

In treating all inflammatory attacks it is of the utmost consequence to employ the remedial measures as early as possible, and in none is it more necessary to do so than in this. Free general depletion, followed up by cupping on the neck, powerful cathartics and injections, shaving the head, and applying cold to it, are the means to be chiefly trusted for breaking the strength of the dis-

order. By leeching the temples, and keeping up a copious secreting action of the bowels, the remaining symptoms are in general removed, if the other more efficient measures prove successful in subduing the force of the disease. Sometimes the inflammation assumes a chronic form, which, though not attended with much immediate danger, is very distressing, and may lead to permanent affections of a very unpleasant kind. In this case the patient's pulse does not descend to the natural standard, but continues small and frequent; his tongue displays a yellowish-white fur, his skin is hot and dry, he has no appetite, his sleep is disturbed, he complains of headache, his complexion is sallow, and the expression of his countenance indicative of anxiety. Free purgation, and blistering of the head, are the best means of counteracting the morbid condition which gives rise to these symptoms, and which, if permitted to go on, may occasion thickening of the membranes, or disorganization of the brain, attended with epilepsy, fatuity, and ultimately with death.

It appears that the *dura* and *pia mater* may also suffer from concussion, since they sometimes inflame, and produce peculiar symptoms in cases where the head has been subjected to violence, that can act only in this way. Blows which expose the bone are the most common sources of such effects, and frequently give rise to them, though of inconsiderable violence. The patient, after a little confusion or stupor, may feel quite well, and follow his ordinary pursuits for several days, at the end of which, generally from the seventh to the eleventh, he begins to show some indication of the disease that is going on within his head. The pulse becomes frequent and wiry; his tongue is furred; his countenance anxious; his sleep broken; and he feels a general uneasiness, with indisposition for all active exertion, whether of body or mind. Headache, with intolerance of light and noise, then succeeds, with occasional rigors; but delirium and convulsions are more slow of appearing than when the cerebral substance is the seat of inflammation. At length these symptoms present themselves, and are speedily followed by insensibility, involuntary discharges from the bowels, and death. On dissection, an effusion of pus is generally found occupying a more or less extensive portion of the surface of the *dura mater*, which is separated from the bone, and altered both in color and consistence, or the subjacent *pia mater* and substance of the

brain. As the approach of this disorder is slow and insidious, while the means of checking it can be used with effect only in the commencement of its progress, all injuries of the head that can possibly give rise to it ought to be treated with care.

The patient should for weeks abstain from every kind of excitement, and endeavor to preserve his secretions in the most healthy state. Quickness of the pulse and headache suggest free venesection, with the internal administration of tartrate of antimony, either alone or combined with the saline cathartics. If repeated rigors succeed signs of inflammation, and especially if the patient becomes insensible, it may be presumed that pus has been effused; and the only chance of his recovery is afforded by perforating the cranium, so as to give the matter free vent if it is lodged between the bone and the *dura mater*. If not found there it may exist deeper, but incisions in search of it would be quite unwarrantable. Puffiness of the scalp, and a glassy dry appearance of the wound, if there be one, have been insisted upon as important indications of suppuration of the *dura mater;* but they often exist in cases where there is nothing of the kind, and, therefore, ought not to be confided in.

The operation of perforating the skull is performed in this country with a Trephine or circular saw, to which the necessary rotatory motion is given by the hand. On the continent, an older instrument named the Trepan, which works like a carpenter's brace, is still in use; and it is difficult to understand how the latter should ever have given place to the former, the use of which renders the process much more tedious and laborious. The only objection that can be alleged against the trepan is, the risk of its injuring the *dura mater* or brain; but the apprehension of this rests entirely on theoretical grounds, as with moderate care any chance of such an occurrence may be prevented. The patient should be laid on a support low enough to render it unnecessary for the operator to elevate his arms in working the saw. If the bone is not sufficiently exposed by the original injury, a crucial or triangular incision must be made through the scalp, the flaps of which are then to be dissected back. The pericranium is next scraped off sufficiently to prevent it from impeding the teeth of the saw, which is applied at first with its center pin protruded to keep it steady, and afterward, when a groove has been formed, this ob-

stacle to its progress is removed. The sawing must be conducted cautiously, as the skull is not always equally thick, and is often throughout very thin, with hardly any perceptible diploe. A tooth-pick, or probe, should be introduced from time to time, to ascertain whether or no the bone is perforated at any part of the circle; and when the whole seems to be nearly cut through, a levator or forceps may be employed to raise the detached piece. If circumstances appear to require the removal of more bone, the same means are to be repeated,—or the process may be accelerated, if the portion is extensive, by Hey's saw, as it is usually called, which proves convenient for connecting the circular apertures together so as to separate at once a large portion of the cranium. After the operation the wound is to be lightly dressed, and the general treatment conducted with the view of checking any tendency to inflammatory action. Cases admitting of this operation with any prospect of success are extremely rare, as the suppuration generally extends over a large surface of the membranes, or engages the substance of the brain, and I never knew an instance of its successful performance.

Compression of the brain, when a consequence of external violence, is directly caused either by effusion of blood or by depression of the skull. In both cases the symptoms are the same, and denote suspension of the cerebral functions, more or less complete. The patient lies as if in a profound sleep; his breathing is stertorous; his pulse slow and laboring; his pupils immovable and in general dilated. He groans occasionally, winces under pressure applied to the injured part of his head, and frequently raises his hand to it. This state may continue, without suffering any material change, for a period of indefinite length, from hours to weeks, or even months; but generally terminates in the course of a few days at furthest, either in a return to health, or in inflammation. Effusion of blood may take place between the skull and *dura mater*, on the surface of the brain, and into its substance. In all of these situations it depends on rupture of the vessels from concussion; and, therefore, the symptoms of that kind of injury are at first generally associated with those of compression. As the symptoms of concussion, however, always go off soon, unless the brain has been lacerated, it may be concluded, if the patient remains insensible beyond an hour or two, that there is either an

effusion of blood, or rupture of the cerebral substance. The latter case may be, in general, distinguished by the more complete insensibility, and other indications of suspended function which attend it, and by the early appearance of inflammatory symptoms. It seems that the effusion does not always occur immediately after the injury is sustained, but sometimes takes place gradually, so that there may be either no insensibility observable for a short period after the blow is inflicted, or an interval between the insensibility caused by concussion and that resulting from compression. In this case there can be no doubt as to compression being the cause of the symptoms. The quantity of blood effused is seldom great, but may amount to several ounces. Between the skull and *dura mater* it usually takes the form of a cake, of limited extent; on the surface of the brain it constitutes a thin crust or lining, widely spread over it; and in the substance of the organ it is generally coagulated at the center of the injured part, and diffused, in the form of ecchymosed spots, into the neighborhood. The largest accumulations of blood are met with between the *dura mater* and the anterior inferior angle of the parietal bone, where it seems to be effused from the meningeal artery. The extravasation, in general, takes place either immediately under the part subjected to violence, or on the side of the head opposite to it.

Depression of the cranium happens more readily in young than in old subjects; but produces less inconvenience in the former than the latter, owing to the yielding condition of the bones at their time of life, which allows the cavity, when diminished at one part, to expand in another. Where a perceptible depression exists, the symptoms may be fairly referred to the compression thus caused; since, when the case is broken, it is not likely that the contents should be so much shaken as when it remains entire.

It was formerly thought that the symptoms of compression peremptorily required the immediate performance of an operation for raising the depressed portion of the skull, or affording vent to effused blood. The ample experience of a different practice, followed in modern surgery, has proved that in most cases, unless the substance of the brain has suffered serious injury from concussion, the condition of the patient laboring under compression will not be altered for the worse, and in many will amend, if some

days are allowed to elapse after the injury has been sustained before proceeding to trepan the skull. The salutary change depends, no doubt, partly upon the effects of absorption,—partly upon the brain becoming accommodated to the diminished size of its containing case; and it will be promoted by bleeding, active cathartics, and powerful injections thrown into the rectum. If the symptoms do not diminish, or if they increase, the operation must be performed; and the proper time for determining on it is regulated by the particular features of the case. Should depression of the skull be associated with a wound of the scalp, penetrating to the bone, a very short trial of the means calculated to supersede the necessity of an operation will be sufficient, as the fracture is already a compound one, and consequently not liable to be aggravated in this important respect by trepanning. On other occasions, two or three days may generally be allowed to pass without any bad consequences. In operating for depression of the cranium, the saw should be applied on the sound part, so as to remove the overlapping edge that prevents the broken portion from being raised into its place by a levator, or taken away altogether. If the blood effused is found under the *dura mater*, which then appears unusually tense, and presents a bluish appearance, an opening ought not to be made through the membrane, since there is great danger in cutting into the cavity of the arachnoid, and little advantage is to be expected from doing so, as the blood in such a case is spread over an extensive surface, and the brain is in some measure relieved from pressure by the aperture that has been formed in the bone.

Fractures of the cranium would be of very little consequence, were it not on account of their connection with injury of the organs which it contains. In reference to this, they may be conveniently divided into Fissures, Depressions, and Punctures.

A Fissure, as the name implies, is merely a solution of continuity in the bone, without any material displacement of the edges of the fracture. It is caused by diffused force acting directly, or transmitted to a distant part of the cranium by the intermediate portion remaining entire, and conducting it where the strength is less able to resist. The base of the cranium is generally the part broken in the latter way, or by *contre-coup*, as it is called; and the fissure usually extends through the cuneiform process of the

occipital bone, transversely or obliquely backward. Bleeding from the ear often accompanies, though it does not necessarily proceed from, a fissure of this kind. Fissures, as might be expected from the mode of their production, are in general followed either by speedy death, or by violent inflammation of the cerebral substance and membranes. These bad consequences were attributed by the old surgeons to the split of the bone allowing noxious transudations from without inward, and their practice consisted in sawing away with the trepan, as far as they possibly could, all traces of the injured bone. In the more sound pathology of the present day, fissures are regarded as quite innocent so far as regards their own effects,—but as affording ground of unfavorable prognosis, by showing that the skull has been subjected to a great degree of concussion. They are, however, seldom known to exist until after death, since no one now thinks of searching for them, as was the custom formerly.

Fractures with depression result from the operation of forces acting on a somewhat extensive surface which gives way before them. The contents of the cranium are consequently not much shaken; and as the depressed portion presents its smooth side to the membranes, there is comparatively little risk of inflammation being excited in them. It has been already explained, in regard to compression, that it is not considered right in modern surgery to interfere by operation with such fractures, unless the symptoms denoting compression of the brain should be well marked, and persist after a moderate period, during which proper measures are employed for promoting the accommodation of the organ to the alteration that has taken place in the shape and size of its containing case.

Punctured fractures are inflicted by sharp-pointed bodies, which apply their force with concentrated effect. They perforate, or beat in, a small portion of the external table of the skull, which, acting on the more brittle, internal, or vitreous part, generally depresses it to a considerably greater extent, in the form of a flattened cone, the apex of which corresponds with the center of the injury. The sharp edges and points of bone thus driven inward are apt to lacerate the membranes, or at all events irritate them, so as to excite inflammation. Sometimes the bad effects thus produced are of a chronic kind, and the patient, months or

years after the injury has been sustained, may suffer from pain, discharge, or epilepsy, caused by the irritation of a scale of bone pressing on the *dura mater* or brain. In the first instance, this injury is attended with little inconvenience, since the skull being broken, there is little concussion, and no internal effusion of blood, while the extent of bone depressed, though it may be considerable when compared with the size of the external wound, is not so great as to occasion any sensible degree of compression. But no fracture is really so dangerous, or so much entitled to attention on its own account, and it ought always to be regarded as requiring an immediate operation. In performing this, it is rarely necessary to convert a simple fracture into a compound one, as the bone is in almost every case exposed by the blow that caused the injury. In general the aperture is large enough to allow the broken pieces to be picked out; but sometimes it is necessary for this purpose to remove a circular portion by means of the trephine. In this case the center pin of the instrument should be fixed at the margin of the opening, as near as possible to the middle of the injured part. After the operation the patient must be protected from all sources of excitement, and freely depleted if threatenings of inflammation appear.

Wounds of the brain, unless very deep or extensive, are not immediately attended with any remarkable indications of the injury, except what may be presented to view by the part itself. The patient often walks, speaks, and conducts himself in other respects as if not materially hurt. Inflammation almost inevitably, however, soon comes on, and proving no less intense than uncontrollable, usually terminates fatally in the course of a day or two. The treatment ought to be directed with the view of preventing and checking these bad consequences, but will seldom be productive of much benefit, and therefore the prognosis in such cases is very unfavorable.

Hernia cerebri is a protrusion that frequently occurs when the *dura mater* has been exposed or injured in consequence of external violence. The membrane becomes prominent, discolored, soft, and at length perforated by a small aperture, which enlarging, allows a fungous excrescence to expand itself. This growth is found on dissection to consist of a bloody mass, in which some traces of the cerebral substance can be discerned, and seems to

resemble in constitution the fungus of the testicle that has been described above. It probably depends upon the brain having been injured by the concussion proceeding from the blow which caused the injury, and suffering in succession ecchymosis, inflammation, and suppuration, which, extending to the *dura mater*, effects its perforation, and permits the soft substance of the brain to escape from the pressure that it sustains within the cranium, mixed with coagulated blood effused into its interstices, so as to present the appearance of a solid tumor. The treatment of *hernia cerebri* which proves most beneficial consists in the free excision of the protruded mass on a level with the surface of the *dura mater*, and the subsequent application of pressure by means of lint, together with a plate of lead suited to the size of the aperture in the bone. With the assistance of such means the patient sometimes recovers, but more frequently sinks under the irritation attending the disease.

The scalp is liable to various injuries, of which the first that may be mentioned are Bruises. The most common effect of these is the appearance of a firm round flat tumor, owing to effusion into the cellular substance, which takes place almost immediately after the blow is inflicted, and then gradually diminishes without any remedial measures, so as to leave, in the course of a few days, no trace of its existence. When the contusion is more severe, blood is effused under the integuments, so as to constitute a fluctuating swelling, the extent of which is very variable, from that of the point of a finger to a half or more of the surface of the cranium. The edges of the scalp surrounding it are very firm, and somewhat thickened, whence there is some risk of erroneously supposing, from a careless examination, that the skull is depressed. The blood is usually absorbed either spontaneously, or under the influence of a discutient lotion, assisted by pressure, but occasionally excites sufficient irritation by its presence to cause the formation of an abscess. Should this change occur, a free opening must be made for the escape of the matter; and, if the quantity of fluid effused in the first instance is very large, or does not soon show signs of being absorbed, it may be well, in order to hasten the cure and prevent suppuration, to evacuate the cavity of its contents, and then carefully press its sides together. In some rare cases, one or more of the larger arterial

branches are ruptured, and the tumor then not only fluctuates, but pulsates. External pressure is found quite ineffectual in checking the accumulation when proceeding from this source, and the only method of remedying it consists in laying open the cavity, sponging out the blood, and securing the injured vessels by ligature, or the application of compresses on their orifices. Bruises of the scalp, though perhaps apparently very trivial, are sometimes followed, at a distant date after the accident, by very disagreeable symptoms, denoting chronic inflammation of the pericranium or *dura mater*. In such cases there are usually indications of constitutional derangement previous to the accident, and means proper for correcting this general disorder may be sufficient to remove the local complaint. But if the patient, after being subjected to an alterative course of diet and medicines, still suffers from painful sensations of the scalp, aggravated by pressure on the injured part, from headache and sickness, or from perversion of any function connected with the cerebral organs, a crucial incision ought to be made down to the bone, and be prevented from healing until it is closed by the contraction of the granulating process.

Wounds of the scalp are to be treated in accordance with the general principles that have been explained. The neighboring hairs should be always shaven clean away, and those more distant cut short to prevent them from insinuating themselves between the edges of the sore, collecting blood or other matters discharged from it, or impeding the application of dressings. If the scalp is detached from the bone in the form of a flap, it ought not to be cut away, as was done previously to the time of Mr. Pott, who showed the advantage of allowing nature to determine how far the part was rendered incapable of recovery. No inconvenience arises from replacing the flap in the first instance; and if even a portion only of it should be saved, the cure will be greatly accelerated. When sand or other impurities are lodged in the wound, it must be carefully washed; and if this proves insufficient, a poultice may be applied until the surface is freed from all foreign matters. All wounds of the scalp, but especially those of a punctured form, are apt to occasion extensive inflammation of the neighboring integuments. It would not be proper, by way of preventing this, to make any incisions in the first in-

stance; but if the bad consequences in question should ensue, free dilatation, together with warm fomentations and poultices, ought to be employed without delay, while the general treatment of the patient is conducted so as to conduce to the soothing effect desired.

Diseases of the Coverings and Contents of the Cranium.

Encysted tumors occur very frequently under the integuments of the scalp. They generally consist of a very thick and firm cyst, which contains a mixture of fluid and pultaceous matter. They vary in size from that of a walnut downward, and unless subjected to pressure or ulcerated, are very loosely connected, so that when a knife is thrust through the integuments and cyst in its long direction, the latter may be readily pulled away with the forceps, or turned out with the handle of the knife. Tumors of this sort are not unfrequently observed to be hereditary. More rarely, cysts of a thinner texture, and containing lardy-looking matter, generally intermixed with hairs, are met with in the scalp, chiefly at its lower and back part, near the neck. These adhere more firmly, and require to be dissected out. They often attain a very considerable size.

The only disease of the contents of the cranium, not depending on external injury, that has ever been subjected to surgical treatment, is Hydrocephalus, or a morbid accumulation of fluid. The fluid is generally inclosed in the ventricles, but sometimes lies exterior to the surface of the brain, which is then usually more or less malformed. The disease is either acute or chronic: in the former case occurring suddenly as a consequence of inflammatory action; and in the latter commencing insidiously without any such antecedent symptoms. Acute Hydrocephalus may take place at any period of life, but is most common in children. The quantity of fluid seldom exceeds an ounce or two, and death is caused probably not more by the pressure of the water than by the destruction of the cerebral substance occasioned by the inflammation which attends the effusion. The chronic form of the disease always commences in childhood, and is not unfrequently congenital. The accumulation of fluid slowly increases, and the bones of the cranium not being united, are separated by stretch-

ing of their connecting membranes, so as to allow the quantity at length to weigh several pounds, without much interfering with the functions of the brain, which becomes expanded into a bag-like form, and loses all trace of convolutions except on its inferior surface. The patient in such cases has the power of locomotion diminished, and his body becomes excessively attenuated; but existence is often prolonged for many years, and may at length terminate in a way not connected with the disease of the brain.

The great object in treating acute hydrocephalus is to subdue the primary inflammation, since the case is nearly hopeless when effusion takes place. It is evident that the mere removal of the effused fluid by operation, though it might for a little diminish the symptoms of pressure on the brain, could not afford any permanent advantage, and the operation for this purpose would necessarily be attended with the danger that attends all wounds of the cerebral substance. Few attempts have accordingly been made to cure the disease by puncture, and the results of these confirm the unfavorable opinion of the practice that was previously entertained on theoretical grounds.

In Chronic Hydrocephalus the accumulation of fluid constitutes the whole of the morbid condition, and consequently evacuation of it may not appear an unreasonable mode of affording relief. The operation has, accordingly, been frequently performed, but not with such success as affords any encouragement to repeat it. This will not appear surprising, if it is recollected that, in all other dropsical swellings, paracentesis hardly ever affords more than temporary relief, and that, in the particular case under consideration, there are circumstances peculiarly opposed to a more permanent recovery. The unyielding nature of the parietes of the cranium, even though at some parts remaining in a membranous state, must equally prevent the complete removal of the fluid, and the employment of effectual compression afterward to oppose its reproduction. No great risk seems to be incurred, in the first instance, since the wounds made by introducing the trocar have generally healed without producing any bad consequences, which may perhaps be accounted for by the thin expanded state of the cerebral substance, but the progress of the case is usually accelerated rather than checked.

Injuries and Diseases of the Spinal Canal and its Contents.

The spinal cord is liable to concussion from blows and falls, particularly the latter, the symptoms of which are similar to those of concussion of the brain, inasmuch as they denote suspension of the functions usually exercised by this part of the nervous system. As these consist chiefly in conduction of the impressions producing sensation and voluntary motion, the patient loses more or less completely the feeling and power of moving in all the portion of the body which is supplied with nerves originating from the spinal cord, below the part where it has suffered from the external violence. The organ does not recover from this state of inaction so soon as the brain,—a day or two at least almost always elapsing before any well-marked sign of improvement is perceptible. It is probable that the cause of this may be a complication with effusion of serum, or blood, occurring in consequence of the injury, which, subsequently undergoing absorption, allows the usual actions to be restored.

In cases of this kind the treatment, in the first instance, should consist merely of rest, and, if necessary, introducing the catheter to draw off the urine. The patient, though insensible to external stimuli, generally complains of uneasy feelings, sometimes amounting to intense pain, in the paralyzed part of his body; and if the state of his pulse, or other symptoms, such as flushing of the face, tenderness of the back to pressure, etc., should indicate the commencement of inflammation, general and local bleeding, warm fomentations, and purgative injections must be assiduously employed to arrest the morbid process. After the acute symptoms have been subdued, and also in cases where the injury has not been primarily followed by them, the patient sometimes makes very slow progress in regaining the powers he has lost. Counter-irritation by blistering, tartrate of antimony ointment, or the actual cautery, then often proves extremely useful; while warm bathing, with friction, and attempts at exercise, are diligently used to excite the languid energies of the limbs.

The vertebræ are liable to dislocation and fracture, but never suffer in either of these ways without the operation of extreme violence, except in the cervical region, where the parts concerned

are least firmly constructed, and sometimes suffer displacement from a degree of force not so very great. Dislocation seldom occurs unaccompanied by fracture; and the medullary cord is almost always much injured at the time, independently of the pressure apt to be permanently caused on it by the disjointed or broken vertebræ. The symptoms resulting from such injuries are nearly the same as those of simple concussion or compression, and the distinction between them depends on the former being generally more severe, as well as obstinate, but chiefly in the alteration of shape which is discovered in the spinal column. It has been stated that dislocation of the spine always terminates fatally, either in the first instance, or in the course of a few months, owing to the chronic inflammation, and alteration of structure occasioned by the injury; but this is not altogether correct, since recoveries in such circumstances do take place, though certainly very rarely. The prognosis, therefore, must be unfavorable.

The treatment does not admit of replacement of the dislocated surfaces through the agency of external means, and the removal of portions of bone by operation to facilitate reduction, though it has been attempted, offers no reasonable prospect of benefiting the patient, while it must increase the danger of bad consequences by adding to the irritation. The vertebral canal is so much wider than the nervous cord which it contains, that a mere alteration of its direction, even though pretty acute, could hardly produce any very important effect on the functions of the organ; and if the displacement were so great as to make the bones press injuriously upon it, there is every reason to suppose that taking away the portions of vertebræ concerned, even granting it could be done without mischief, would be of no use in remedying the derangement of the structure of the cord. The patient, therefore, should be treated as if he had merely suffered concussion or compression. Symptoms of inflammation should be checked—the discharges from the rectum and bladder duly maintained—and if the immediate danger is surmounted, the means proper for subduing chronic disease at the injured part, should it be required, or for rousing the energies of the limbs, in case they remain defective in their power, must be carefully employed.

The only disease of the spinal marrow that affords subject of surgical practice is that sort of *Spina Bifida* in which the nerv-

ous parts are perfectly formed, but the membranes are distended with fluid so as to protrude through the aperture of the spine and constitute an external tumor. The integuments at the part, which is usually the lumbar or sacral region, are generally thin, livid, and adherent. This disease is often associated with other congenital malformations adverse to the duration of life, but, when existing by itself, is not necessarily fatal. The thin parietes of the tumor sometimes ulcerate so as to form a minute orifice, which, opening from time to time, allows the fluid to escape, and thus at length completes the cure. In imitation of this natural process, small punctures have been made with a needle (Sir A. Cooper), pressure being afterward carefully exercised, and the practice has occasionally proved successful. It is evident that the circumstances are here much more favorable for recovery after puncture than in the case of dropsy within the cranium, since the membranous nature of the sac which contains the water permits it to be readily compressed. The operation may also be rendered more effectual by injecting the tincture of iodine.

Injuries and Diseases of the Nerves.

When a nerve is divided, the part to which it is distributed is immediately deprived of sensation and voluntary motion, and also suffers a diminution in the energy of its vital action, the consequences of which are coldness, emaciation, and proneness to ulceration and sloughing. If the respective extremities are not separated to any great distance, they generally become united by a new-formed substance, and in some rare cases nervous fibrils have been traced from one extremity to the other. If a nerve is only partially divided, the wound is generally slow in healing—uneasy sensations are felt by the patient, who refers them to the part where the injured nerve is distributed—and the edges of the external sore are red, tumid, and extremely sensitive to external impressions. In such cases, warm fomentations, and other soothing means, afford some relief; but the most effectual measure for rendering it complete is to cut the wounded nerve entirely across. When a foreign body is lodged in the substance of a nerve, the same symptoms that have just been mentioned are produced in an aggravated degree. Agonizing pain and spas-

modic contraction of the muscles are then induced, so as to make the patient willingly accept the severest terms for obtaining a release from his sufferings. Excision of the irritating body ought of course to be performed if practicable, and, if this cannot be done, amputation must be resorted to as the only remedy.

Symptoms very similar to those resulting from injury of a nerve sometimes occur without any local circumstances to account for them. The part affected is generally the face. The pain and spasmodic action of the muscles are not constant, but occur in paroxysms, which either come on spontaneously, or are induced by movement of the jaws, the operation of cold, heat, or stimulating food, and often mere mental emotion. This *Tic-Douloureux*, as it is called, was formerly treated by simply dividing the nerve affected; but with so little permanent benefit, that the operation fell into great discredit, and was replaced by the use of constitutional remedies, such as a succession of smart purgatives, especially croton oil, and the carbonate of iron, administered in large doses. But it has lately been found that more permanent though not lasting relief may be obtained by removing a portion of the nerve, so as to insure its complete division and effectually prevent its reunion.

The nerves sometimes become the seat of tumors, which are generally of a firm fibrous structure and yellowish color, but have been met with of a soft pulpy consistence. They seem to be formed between the nervous fasciculi, which can be traced over one or more sides of the swelling. They are generally smooth, round, or oval; and of a size intermediate between that of a pigeon and hen egg. They occur most frequently in the large nervous cords of the superior extremity, between the elbow and shoulder and at the wrist, for the most part commence about the middle period of life, and are observed more rarely in females than males. They are usually the seat of more or less constant uneasiness; and when squeezed or otherwise irritated occasion pain, with spasmodic twitching of the part to which the nerve affected is distributed. They are recognized by their symptoms, by their situation, and by their greater mobility in the transverse than longitudinal direction of the limb. The proper treatment of these tumors, as all external remedies are of no use, is to cut them out. The immediate effect of this operation is insensibility and paralysis of the

part concerned; but through time the patient generally recovers, in some degree, the powers thus lost; and, at all events, is freed from the annoyance of the disease, which is often so great as to render his life miserable.

Tumors of a similar kind are not unfrequently met with at or near the extremities of nerves divided by amputation. The enlargement seldom attains a considerable size, being generally that of a pea or marble. It is extremely sensitive to external pressure, which excites intense pain, referred to the limb removed, with spasmodic contraction of the muscles of the stump, while the tumor, even though not mechanically irritated, is hardly ever free from uneasiness. The only remedy is removal, which may be effected either by simply excising the affected part, or performing a secondary amputation, which is the more eligible course when the stump has been in other respects imperfectly formed.

The Subcutaneous Nervous Tubercle, as it is called, though not distinctly connected with the nerves, so far as can be traced by dissection, yet agrees so much in its symptoms with the tumors just described that it certainly ought to be considered along with them. It is almost always about the size of a pea, smooth, round, or oval, and of a firm yellowish structure. It is seldom, if ever, observed to increase, being as large when first discovered as it is found to be at any time afterward. It is seated immediately under the skin, which it slightly elevates; occurs on the inferior extremities much more frequently than on the superior; and is more rare in males than females, who are usually affected with it before middle age. In one case, the subject of which was a middle-aged lady, I found a tumor of this kind lying under the nail of the little finger. It is the seat of uneasy sensations, which suffer occasional paroxysms of exacerbation, sometimes periodically, but chiefly in consequence of excitement, either local or general. Emotions of the mind often produce this effect; and it is frequently observed that the same circumstances which induce the attacks, when repeated, cause their sudden cessation. The only remedy for the disease is excision, which no less easily than quickly and safely relieves the patient from it.

CHAPTER XXI.

SKIN.

Erythema, Erysipelas, and Anthrax.

THE skin is liable to inflammation in consequence of very numerous and various irritations direct as well as indirect. When proceeding from the former, it is either attended with merely local inconvenience, or, if sufficiently severe to disturb the system, occasions symptomatic fever, which presents the usual characters of that accompanying inflammatory affections. The morbid action of the part concerned does not tend to diffuse itself more extensively, and, according to the particular circumstances of the case, terminates in resolution, mortification, suppuration, effusion, ulceration, or diseased nutrition. Inflammation of the skin, resulting from indirect irritation through constitutional disturbance, is distinguished by some important differences, of which the most deserving of attention are its tendency to spread, and the peculiar nature of the disorder in other parts of the system that is connected with it. The terms Erythema, Erysipelas, and Anthrax, the last of which may include Carbuncle and Boil, are used to denote the principal modifications which it presents. The first is applied to a very superficial redness, attended with hardly any perceptible swelling, evanescent on pressure being applied, having an extreme tendency to spread over the body, occasioning a hot burning sensation, and terminating in resolution or death. It is preceded and accompanied by great constitutional disturbance, being ushered in with prolonged and repeated rigors, sickness, and retching, which is sometimes almost incessant for several days together. The pulse is extremely quick, but not strong; the tongue is coated with a yellowish-white fur, inclining to be dry; the skin is very hot, often raising the thermometer to 104°; the patient complains of an insufferable burning sensation all over the

body; his countenance has a yellow hue and anxious expression; his mind is weak, and apt to wander. The mucous membranes of the lungs and intestines are often in an excited state, giving rise, by their increased secretion, to crepitation in breathing, and diarrhœa. The disease is extremely distressing and in general very obstinate, recurring again and again after the principal attack appears to have been subdued; but it does not often prove fatal. When death does ensue, it happens either from derangement of some internal organ, especially the brain and lungs, or from exhaustion caused by the continuance of the fever. Erythema is sometimes associated with an inflammatory state of the subjacent cellular substance, which is distended so as to cause a puffy sort of swelling, and generally soon afterward becomes the seat of purulent effusion, or not unfrequently of sloughing.

The disease generally appears in persons on the surface of whose bodies there is a solution of continuity. This may be either recent or of old standing, but the latter condition seems on the whole most favorable to attacks of the disease. The patient is rendered more liable to be attacked by having a bad constitution, or one disordered by an unhealthy mode of life. The grand exciting cause seems to be some peculiarity of the atmosphere, such as that existing in crowded, ill-ventilated hospitals, or even in open situations during particular seasons. In such circumstances, the wound, if recent, is often nearly healed before the erythema appears. The erythema commences in the neighborhood of the sore, and then leaving the skin there in its natural state, travels over the trunk or limbs, or nearly every part of the body in succession. There is hardly any treatment of a local kind that can be used with advantage. Leeching or cupping the inflamed part affords relief for the time, but seems to have no effect in arresting the progress of the disease. Of internal remedies the most useful in the first instance are emetics, which sometimes appear to cut short the morbid process. The mercurial and saline purgatives, with gentle diaphoretics, should be frequently administered,—blisters applied to the epigastrium seem very serviceable,—and opiates have often a remarkably good effect in soothing the sensation of heat on the surface of the body, procuring sleep, and otherwise diminishing the uneasy symptoms of the disease. General bleed-

ing can rarely be used with propriety, and stimulants are hardly more admissible except in the advanced stage.

By Erysipelas is understood an inflammation of the skin, more deeply seated and less disposed to shift its place than erythema, and which tends to terminate in effusion of serum under the cuticle, elevating it into vesicles. The skin may be affected either alone or together with the subjacent cellular texture. In the former case the swelling, though distinctly perceptible, is slight, the surface is red, tense, and glistening, and vesicles of variable size soon make their appearance. In the latter, which is styled phlegmonous erysipelas, the swelling is more considerable, but the other symptoms are the same; and the most important difference is established by the result, which is apt to be suppuration or sloughing. The constitutional disturbance that precedes the appearance of erysipelas is of the same kind as that which goes before erythema, but seldom proves so severe. The patient complains of headache, bad taste in his mouth, and coldness; and when the skin inflames, his general uneasiness, so far from increasing, generally diminishes very much, or entirely subsides.

The head is the part of the body most frequently affected by erysipelas, and, along with the external inflammation, there are usually symptoms denoting an excited condition of the internal organs. The causes of erysipelas resemble those of erythema, but differ in so far that they depend more upon peculiarities of the individual. It occurs as often when there is no wound as when there is one; and it is almost confined to those persons whose general health is previously deranged, particularly in regard to their biliary secretions, and by intemperance. In the treatment more benefit is derived from local remedies, and antiphlogistic measures of a general kind are more frequently required than those of a stimulating nature. When the head is concerned, blood should, if necessary, be abstracted by venesection; and it is only when the patient's system is extremely weak that an opposite method ought to be pursued. A dilute solution of the tartrate of antimony, with the supertartrate of potass, or the saline purgatives, if given so as to maintain a degree of nausea, with copious discharge from the bowels, exerts a powerful influence in subduing the disease. Of local means, those of a repellent kind, such as cold lotions, are considered unsafe, at least if they are used before the constitu-

tional disorder has been removed. Bleeding from the inflamed surface sometimes affords benefit, and may be obtained by leeching, puncturing, or scarifying. It has been objected to the use of leeches, that it may excite irritation by the bites, but this inconvenience has not been experienced in practice. Punctures to the number of from ten to fifty, repeated once or twice a day (Sir R. Dobson, 1828), have been preferred by some as free from this objection, besides being more economical and convenient. Incisions of an inch or two in length, and made fairly down to the cellular texture (Copland Hutchison, 1814), are of great use in the phlegmonous form of the disease; both, in the first instance, by cutting short the inflammatory process, and also in the more advanced stage by facilitating the discharge of pus or sloughs. Longer incisions, equal in extent to the inflamed surface, and sometimes exceeding one or two feet, have been recommended (Lawrence, 1828), but seem to have no advantage to compensate for their severity, and cannot be regarded as exempt from danger in systems not particularly strong. There are few cases that require incisions of any kind; and great mischief has resulted from their too indiscriminate employment. In persons who are very weak, and suffer intense pain, the best application is a warm solution of acetate of lead with opium. When there is much swelling of the part affected (Œdematous Erysipelas), pressure is found very beneficial, both before suppuration, and while sinuses exist after the matter is discharged. If sloughing takes place (Gangrenous Erysipelas), poultices are proper until the dead parts are thrown off, after which a nutritive diet is all that the patient requires. The last-mentioned form of the disease sometimes occurs with very acute symptoms, and runs its course in despite of every sort of treatment, so as to terminate fatally within a few days from its commencement. It generally originates from some slight local injury, such as a prick or scratch, but occasionally commences without any breach of the surface having been sustained. It is always preceded by, and accompanied with, extreme constitutional disturbance, of which the most remarkable features are excessive rapidity of the pulse, great frequency of respiration, want of sleep, anxiety, dusky complexion, and dark color of the tongue, lips, etc. Free incisions, hot fomentations, calomel with opium, administered internally, and a liberal allowance of wine or other

stimulants, are the means best calculated to afford relief in this most alarming state, which may be regarded from the first as all but incurable.

By Anthrax or Carbuncle, and Furunculus or Boil, are implied different degrees of a similar affection of the skin, consisting in an inflammation fixed to the part where it occurs, but tending to spread in its extent, attended with intense pain, and terminating in suppuration, with more or less sloughing. The disease is met with of all sizes, from that of a pea to that of a plate. It occurs, when large, generally on the posterior surface of the trunk between the occiput and sacrum, and, if small, chiefly on the face and limbs. In other parts of the body it usually attains an intermediate size. There is usually little swelling, but great induration. Small apertures take place spontaneously in the progress of the disease, but as these depend on detached suppurations in the substance of the thickened cutis, they afford no relief. The irritation consequently continues,—the disease enlarges its area,—and if of large size, or seated in a weakly subject, may at length prove fatal. In general, the disease is more distressing than dangerous. It is always preceded by derangement of the system, though it frequently happens that no marked symptom of this attracts attention until the local appearances present themselves. A state of too full health, or assimilation of food disproportioned to the patient's exercise, and also an irritable state induced by intemperance, and derangement of the biliary secretion, are the conditions most favorable for producing the disease. In the form of boil it often exists in various parts of the body at the same time, or occurs in them successively. It is always accompanied with feverish disturbance, proportioned to the extent and acuteness of the local symptoms.

The treatment of all the degrees of this affection should be conducted on the same principles. The first of these is to relieve tension, bleed from the part, and afford free vent to the confined matter, by making a free crucial incision completely through the integuments to the full extent of the disease;—the next is, to promote the cleaning of the cavity, by applying soft poultices;—and the third is, to correct the predisposing state of the system, which has induced the morbid action, by a soothing diet. When the boils are numerous and small, the local treatment that has been

recommended would be more severe than the disease warrants, and may therefore be omitted, while the constitutional means are diligently employed. In the opposite extreme, where the carbuncle is of great extent, it is of the utmost consequence to proceed in the most efficient manner for subduing the local disease, and not only make free incisions in the first instance, but repeat them from time to time if the inflammation should still at any part threaten to extend.

Chronic Cutaneous Diseases.

Under the title of Cutaneous Diseases may be comprehended a great number of affections, apparently very dissimilar from each other, but which are found to differ chiefly in appearance, and in general to agree very closely in regard to the cause of their production as well as the mode of their remedy. They all consist in the existence of some chronic preternatural condition of the skin, and have been arranged into divisions, according to the nature of it. Of these the most important are the Papular, in which the surface is elevated into little pimples,—the Pustular, which consist in small collections of matter,—the Vesicular, in which the cuticle is elevated by small quantities of fluid effused under it,—and the Squamous, in which the cuticle is rendered thick and scaly. The species and varieties of these different kinds, and others that have been noticed, are so numerous, that the most concise description of their distinctive characters would require far more space than can be afforded for the purpose in this work, to which, it may be observed, they do not strictly belong, since, though external in their situation, they are remedied chiefly by internal means.

They originate, in the first instance, with few exceptions, from constitutional disturbance, but frequently become so naturalized to the system as to continue after the derangement that gave rise to them has ceased to exist. Disorder of the digestive organs is the grand source of their production, and they may be regarded as bearing the same relation to chronic conditions of this kind that erysipelas or erythema does to those of an acute form. The circumstances that occasion this disturbance of the abdominal viscera are very various, and many of them were wont to be regarded as the immediate causes of cutaneous disease; but it will be found

that they are not truly so, having always interposed, between their operation and the affection of the skin, some derangement of the digestive functions, which ought more properly to be considered the cause of the disease. In the treatment it is often sufficient to restore the general health, but more frequently it is necessary to conjoin local means with those employed for this purpose, since, as has been already observed, the morbid action of the skin is apt to become habitual, and to continue after the derangement in other parts of the system that gave rise to it has ceased to operate. For correcting the depraved condition of body, all errors of diet must be carefully ascertained and interdicted. The food should be easily digestible, but small in quantity. Bleeding and purging may be used if there seems to be a tendency to plethora. Regular exercise, and an alterative course of mercury, with the saline cathartics, or some mineral water of this kind, are then to be prescribed. In the treatment of scaly eruptions great benefit is derived from the use of corrosive sublimate and Fowler's solution of arsenic; and from the combinations of iodine with mercury and arsenic. Of local means, the one most generally useful is frequent ablution with warm water and soap. Water impregnated with sulphur, such as that existing naturally at Harrowgate and elsewhere, or prepared artificially by dissolving a small proportion of sulphate of potass with sulphur, usually proves more beneficial. If there are any hairs at the part, they ought to be removed, as their presence is not only a constant source of irritation, but prevents the measures for cleansing it from being employed efficiently.

Of medicinal applications, the best are lotions containing the acetate of lead and sulphur; the citrine ointment diluted with axunge or *linimentum aquæ calcis*, in the proportion of one part to four or six; an ointment containing sulphur and axunge in the proportion of one to eight; the ointment of the acetate of lead; a mixture of the two last mentioned; a solution of the sulphuret of potass, or hydro-sulphuret of ammonia; and buttermilk.

Warty excrescences of the skin are of very frequent occurrence, particularly on the face and hands. In the latter situation, they are simple extensions of the natural texture, and prove inconvenient merely from the deformity and awkwardness in using the fingers, occasioned by their presence; but in the former, they con-

sist of formations altogether foreign to that of the skin, and besides being unseemly, are apt, in the more advanced period of life, to take on malignant action, either in consequence of being irritated, or spontaneously. They generally appear on the hands during the period that intervenes between childhood and puberty, and are seldom met with in adults. They may, if it is desired, be removed at once by the knife, caustic, or ligature, of which means the one first mentioned is the best; but are in general readily dispersed by the more gentle method of exciting their absorption by applying some stimulating ointment or lotion. Strong acetic acid answers very well for this purpose, if applied every second or third day. When they are seated on the face, caustic, and all other applications likely to excite irritation, should be carefully withheld from them; and if itching, pain, or increasing size at any time indicates activity, and probable perversion of their nutritive action, excision ought to be immediately performed.

Corns consist of a thickening or induration of the cuticle, induced by pressure, which excites the secreting action of the cutis. The toes, particularly on their lateral aspect, are most liable to this occurrence; and it appears that there is great variety in the predisposition to the disease, which is possessed by different individuals. The symptoms of a corn are precisely what a foreign body of similar size and consistence would produce if placed in the same situation. They may be palliated by slicing off the most projecting part of the induration, by wearing wide shoes, or avoiding walking. The radical cure is often attempted by detaching the corn from its matrix by means of a pointed and flat, but not sharp-edged instrument,—which may be done very completely without bleeding, is always followed by great relief, and sometimes proves permanently effectual. A better method is to soften the corn by touching it with acetic acid again and again until the whole is scraped out, and then apply the nitrate of silver to the exposed surface of the cutis, to destroy its morbid secreting tendency.

Corns are occasionally not hard, but soft, the cuticle constituting them being white and moist. These *soft corns*, as they are generally, though not very correctly, termed, usually prove more troublesome than the others. They cannot be detached entirely, and are apt to inflame, suppurate, and form obstinate sores, if

subjected to irritation. Astringent applications, such as that formed by mixing together equal parts of alum and the white of eggs, often afford great relief.

Diseases of the Fingers and Toes.

The nail of the great toe often occasions much distress, by becoming imbedded at one or both of its edges in the soft parts, instead of lying over and protecting them. This *growing in* of the nail, as it is termed, depends originally in most cases on the pressure of a tight shoe, or on the projecting corners of the nail having been broken off accidentally, or cut away intentionally, with the erroneous view of preventing them from entering the flesh, since they are much more apt to do so when thus rounded off than when left in their natural shape. After the edge of the nail has effected an ulcerated breach, it prevents any step toward reparation, by causing irritation, which inflames and thickens the soft parts concerned, so as to make them overlap more and more. Various methods were formerly employed in the treatment of this complaint, which seldom did more than afford temporary palliation; of these may be mentioned, cutting away the overhanging edge of skin, touching the ulcerated surface with caustic to destroy its morbid sensibility, interposing a plate of some sort between the edge of the nail and the ulcer, and scraping away the morbid part of the nail so as to make it very thin, in order to diminish the force with which it pressed upon the raw surface. M. Dupuytren devised an easy and effectual mode of treatment, which has superseded all the others. This is to remove all that part of the nail which is connected with the ulcer,—an operation that may be effected more readily than might be expected, by thrusting one blade of a pair of strong scissors close under the nail and dividing it quite up to the root, after which the portion that is to be removed being firmly seized with forceps, is twisted out with great ease. Should the nail be exciting irritation at both edges, it will be best to take away the whole of it, for which purpose the preliminary division ought to be made exactly in the middle. The wound should be dressed simply, and heals in a few days in so far as to acquire a cuticular covering. The nail then gradually extends over the surface it formerly occupied, and,

unless subjected to improper pressure, occasions no further inconvenience.

Small Exostoses occasionally grow from the distal phalanx of the great toe, and also, but very seldom, from those of the other toes. They generally form a tumor under the edge or extremity of the nail, and sooner or later seriously impede the use of the foot. The nail, if necessary, having been removed, an incision should be made, first on one side and then on the other, so as to embrace the root of the growth, and divide the soft parts covering it, after which it may be readily detached by the cutting-pliers.

Onychia is an obstinate ulcer seated in the vascular structure that lies under the nail, and envelops its root. It is of small size at first, but gradually spreads so as to engage the whole extent usually covered by the nail. The surface is brown and glossy, the discharge excessively fetid, and the pain intense. The nail is formed very imperfectly, and either remains dry, black, and loosely adherent, or presents merely a small vestige of its root, which is thick, white, soft, and connected by a broad base with its secreting matrix. The surrounding skin is tense and inflamed, and, in cases of long standing, the texture of the subjacent bone is sometimes greatly expanded.

This disease occurs most frequently in children, but is met with at all periods of life, and in the fingers much more frequently than in the toes. It is occasionally referred to local injury, but perhaps always in some measure depends on derangement of the general health. After being established, however, it exists as an independent disease, and can hardly be remedied by means that operate on the system. The treatment requires, in the first instance, that the nail should be completely removed, and then that the ulcer should be touched with caustic potass, poultices being afterward applied until the slough separates, while means are at the same time employed to improve the general health.

Paronychia, or Whitlow, denotes an acute inflammation of the finger, generally resulting from local irritation operating on an irritable constitution. The disease is sometimes confined to the soft parts, sometimes engages the tendons or their sheaths, and sometimes affects the bones. In all cases the best practice is to make a free incision as soon as possible through the seat of the

disease, which is almost invariably on the palmar aspect. When the fibrous tissues slough, the dead parts ought to be carefully withdrawn so soon as they are loose, since their presence acts powerfully in keeping up irritation. Leeches, warm fomentations, and poultices are often productive of great harm in the treatment of paronychia, by directing attention from the only effectual mode of affording relief—namely, incision. After the parts are freely divided a poultice may be applied for a few days, but not longer, as its relaxing effect, if continued, proves injurious. When the tendons or bones are destroyed, amputation must be performed, as the finger, even though it might be healed, could not be of any service to the patient. Exfoliation of the distal phalanx, which frequently occurs, does not require the same proceeding, as the finger, though somewhat shortened by it, is not materially impaired either in appearance or utility.

The Palmar Fascia, on the ulnar side of the hand, is liable to contraction, attended with thickening, which produces more or less complete and permanent flexion of the little and ring fingers. This affection occurs in middle-aged and elderly persons of the male sex. It seems to be induced by violent exertion and pressure of the hand. All kinds of external applications have been found quite unavailing in its treatment, and the only effectual mode of affording relief is to rupture the contracted fibers by forcible extension of the contracted finger, either simply, or after a preliminary subcutaneous incision through part of the band when it is very strong.

CHAPTER XXII.

THE EYE AND ITS APPENDAGES.

Inflammation of the Conjunctiva.

THE conjunctival covering of the eye and eyelids is very liable to inflammation, in consequence of a great variety of irritations, both direct and indirect. Bright light, intense heat, cold wind, acrid fumes, dust, and foreign bodies of all kinds introduced under the eyelids, produce inflammatory symptoms more or less severe, according to the irritability of the individual and the degree of irritation. The suppression of accustomed secretions, through the operation of cold or any other cause, is also a fruitful source of such attacks. The proneness to this inflammation is remarkably increased by habit.

In considering the symptoms of the disease, it is necessary to divide them into acute and chronic. The former are—1. Redness and turgescence of the conjunctiva, the surface of which is everywhere covered with arborescent vessels; 2. Swelling of the eyelids and watering of the eye; 3. Intolerance of light; 4. Pain of the eyeball and forehead; 5. Symptomatic fever. The characters of the chronic form are moderate redness without tumefaction, weakness of the eye when employed for vision, and a disagreeable sensation, as if from the presence of some granular body under the eyelids. Between these extremes there are innumerable shades of difference in the severity of the symptoms, according to the peculiarities of particular cases. When the inflammation is very intense, the turgescence of the conjunctiva is sometimes so great as to cause an obvious swelling of the membrane, which is named Chemosis. It depends on effusion into the loose subjacent cellular texture, partially conceals the cornea, and may even evert the eyelids. The chronic condition almost always remains as a consequence of the acute one, and when it exists independently of this origin, generally proceeds from some chronic source

of irritation, either direct or indirect, as inversion of the eyelashes, or derangement of the digestive organs.

The treatment requires, in the first place, that the eye should be relieved and protected from all sources of irritation. Foreign bodies, if suspected, must be searched for and removed, the eyelids, if necessary, being everted so as to bring the whole extent of their mucous surface into view. Workmen employed in forging or grinding iron are exposed to the entrance of small sparks from the metal into the eye, where they generally fix themselves in the conjunctival lining of the cornea, and, unless speedily wiped off, are apt to become imbedded in its substance, where, being extremely small, they may remain a long while, producing irritation without being discovered. The light of the patient's room should be obscured, and he ought to abstain from all attempts to use the organ. Free evacuation of the bowels by mercurial or saline purgatives, leeches applied to the neighborhood of the eye, and warm fomentations frequently repeated are the means of most use. If fever exists, general bleeding, in sufficient quantity to produce a decided effect on the system, should be employed. The blood may be taken either from the arm or temporal artery, but seems to be abstracted most beneficially in the former mode. When the chemosis is so great as to impede the closing of the eyelids, some portions of the distended membrane may be cut off with scissors, which relieves the distention, and tends also to subdue the inflammatory action. After the intensity of the symptoms has been subdued, and they assume the chronic character, or if they appear in this form from the commencement of the attack, decided benefit is usually derived from introducing into the eye, once a day, a dilute solution of the nitrate of silver. The vinous solution and tincture of opium, with various other stimulating and astringent applications, have been employed at this stage of the disease, but the solution just mentioned is far more beneficial than any of these. Its most convenient strength seems to be obtained by dissolving two grains in an ounce of rose-water, but many use it in a much larger proportion than this. Scarification of the inner surface of the eyelids was formerly much practiced in the chronic state of inflammation, but is now seldom resorted to, as the relief it affords is generally of short duration. It is executed by everting the eyelid to be operated on, scratching

it longitudinally in several places with a lancet, and wiping away the blood as long as it flows, with a sponge or piece of lint. Leeches produce most effect applied to the corners or angles of the eyes, particularly the inner one. In obstinate cases of chronic inflammation, when no permanent source of irritation can be discovered to exist, advantage is frequently derived from effecting counter-irritation by blistering the back of the neck, or introducing a seton into it.

Consequences of Inflammation of the Conjunctiva.

A purulent discharge from the surface of the inflamed membrane occasionally occurs, and constitutes what has been named Purulent Ophthalmy. The inflammation, though probably commencing in the conjunctiva, and chiefly observable in it, generally affects the other tissues of the eye, and is apt to prove very destructive, when allowed to pursue its course, by causing morbid adhesions, opacities, and ulcerations of the organ. It most frequently occurs in infants soon after birth, and in young children. Many explanations have been offered to account for its origin in the former of these, such as the existence of gonorrhœal or leucorrhœal disease in the mother at the time of birth; but careful observation of all the circumstances concerned leaves little doubt that the exciting causes are merely those which conduce to common inflammation, operating on a weakly or bad constitution. It is of great consequence to watch the eyes of children, and especially those of very tender age, lest inflammation should commence and proceed without being discovered until too late. The eyelids are apt to be glued together in the first instance, and though they afterward become tumid, with distended veins, and of a livid hue, attention may still not be directed to the seat of the disease; and when at length the pent-up matter gushes out, the organ is too frequently found irremediably injured.

If the patient is seen during the inflammatory stage that precedes the purulent discharge, which usually does not extend beyond a day or two, a leech ought to be applied at one or both of the angles of the eyes, according to the age and strength of the child. Warm fomentations, and a frequent separation of the edges of the eyelids, are proper at the same time, due attention being

bestowed on the secretions of the digestive organs. So long as symptoms of acute irritation continue, the same soothing system should be pursued; but when the disease begins to assume a chronic form, the solution of nitrate of silver ought to be employed; and in the still more advanced stage, if it prove obstinate, a succession of blisters applied to the back of the neck greatly contributes to arrest the morbid action.

A very violent purulent ophthalmy is occasionally met with in adults who are affected with gonorrhœa. There are two opinions in regard to its production: one being that it depends on a metastasis of the disease from the urethra to the eye; the other, that it proceeds from the irritation of matter casually introduced into the latter part. The former of these explanations seems very improbable; but whatever be the causes of the inflammation, there can be no doubt that it is extremely violent and destructive, in general resisting the most active treatment, and terminating in the serious imperfection or total destruction of the eye as an organ of vision. Free and repeated general bleeding, leeching, and warm fomentations should be used as early as possible; together with powerful cathartics and antimonial diaphoretics. If the disease assumes a chronic form, the treatment that has been already explained will be proper.

Ulceration of the cornea, or its conjunctival covering, is a very common consequence of inflammation. The ulcers are sometimes preceded by small superficial pustules, but more frequently appear without any such antecedent. They are usually small, round, and of a brownish color. They possess a very irritable surface, and consequently maintain the inflammatory symptoms. If large and deep, they leave, on cicatrizing, a permanent white spot named Leucoma. In treating them, the measures employed must be varied according to the acuteness of the inflammatory symptoms; but when these are of a chronic kind, as is usually the case, the solution of nitrate of silver always produces the best effects, and has now completely superseded a practice, formerly much in use, of touching the ulcers with a pointed stick of the lunar caustic. When the ulcers frequently recur, they will be found to depend on some indirect irritation, such as that caused by an unhealthy state of the digestive organs; and of course

any such source of disturbance ought to be removed as soon as possible.

Opacity of the cornea varies in extent and depth. It always proceeds from organizable effusion into the natural texture of the part; but this may be induced in three ways: 1. Inflammation, leading to effusion in the superficial conjunctival covering of the cornea; 2. Effusion of lymph into the substance of the cornea with or without purulent matter; 3. Cicatrization of an ulcer. The first of these is named Nebula, the second Albugo, and the third Leucoma. Nebula is a very common consequence of conjunctival inflammation, especially in children. It occasions various degrees of opacity, according to which, and also its situation in regard to the pupil, it interferes more or less with vision. The remedy consists in the introduction of stimulating applications, which promote absorption. Of these the solution of nitrate of silver is the most efficient. Albugo and leucoma hardly admit of removal. The treatment just mentioned sometimes produces diminution of the opacity, and is certainly preferable to the more severe measures which have been proposed, such as excision or puncturing, since they not only do no good, but generally increase the evil.

Pterygium is a fleshy-looking growth, of firm consistence and flat triangular form. It is seated in the conjunctival covering of the sclerotic or cornea, always beginning in the former, and in its progress tending to encroach over the latter. It generally grows at the internal angle, the apex is always directed toward the pupil; and the transverse diameter of the eye passes through the center of its base. It occasions uneasiness, by obstructing the movement of the eyelids; and, if allowed to pursue its course on the cornea, may ultimately impede vision, by covering the pupil. The local means which are proper for subduing chronic inflammation sometimes check the progress of pterygium; but the radical remedy of it consists in removal. This is readily effected by seizing the growth with a hook or forceps, pulling it outward, and cutting it entirely away with scissors curved to one side. If it be so large as to lead to an apprehension of inconvenience from the contraction caused by the resulting cicatrix,—a portion merely of the disease, about a line in breadth, and running transversely across it, may be removed. The vessels are thus completely in-

terrupted, and the remainder of the excrescence gradually shrinks away.

A granular state of the conjunctiva lining the eyelids is occasionally a consequence of chronic inflammation, particularly when it is associated with purulent discharge. The surface, instead of being soft and smooth, becomes covered with small elevated points or tubercles; and the irritation which is necessarily occasioned by the roughness thus produced, maintains the inflammatory symptoms, so that a reaction is instituted, which renders the ordinary treatment ineffectual. Sometimes, instead of this slight elevation and irregularity of the surface, the conjunctiva is extended into large fleshy-looking excrescences, which roll out upon the cheek when the eylids are separated, and occasionally cannot be reduced without considerable difficulty. In the latter case, excision is the preferable practice; but, in the former condition, which is more frequently met with, though the knife and scissors have been employed, there can be no doubt that the best treatment consists in touching the granular surface from time to time, at the distance of a day or two, with lunar caustic.

Staphyloma is a projection of the cornea, of a round or conical form, and protruding more or less beyond the eyelids. It depends on expansion, together with thickening of the tissue concerned, which sometimes partially retains its translucency, but more frequently loses it entirely. The surface displays arborescent vessels, conveying red blood, and, in cases where the tumor is large, acquires a cuticular covering. The eye is rendered totally useless as an organ of vision; and the patient is apt to suffer occasionally from attacks of inflammation, which are induced by the exposed state of the organ to external irritation. The disease generally occurs as a consequence of inflammation of the purulent kind, but is sometimes brought on by violence. It almost always commences during infancy or childhood; and after attaining a certain extent does not tend to increase. The treatment is either palliative or radical: the former consisting in the use of means calculated to allay the symptoms of temporary irritation; the latter in cutting away the whole of the projection from within a line of the sclerotic, which is easily done by pushing a sharp-pointed knife through it, and then cutting transversely so as to complete the division, first of one half and then of the other, while the flap is

held so as to steady the part under the knife. After this operation, the humors of the eyeball are more or less completely discharged, and the collapsed coats occasion no further trouble, or may even be made the support of an artificial eye to conceal the defect. The best application during this process is a poultice, and if the inflammation runs too high, it must, of course, be controlled by appropriate measures.

Inflammation of the Sclerotic.

The fibrous tissue of the eye is apt to inflame in persons who are subject to rheumatism, or who have had their constitutions impaired by the prejudicial influence of mercury administered for the cure of venereal diseases. The attack is induced by the ordinary exciting causes of ophthalmy, especially exposure to cold. It is characterized by redness of the eyeball, attended with less swelling, and apparently more deeply seated, than when the conjunctiva is the part affected. The distended vessels form a zone round the anterior part of the sclerotic about a line in breadth, and to the same extent distant from the cornea. Beyond this, the vessels in proceeding backward observe a radiating direction, and do not branch out as in the conjunctiva. In chronic cases, the eyeball, along with more or less of the redness that has been described, assumes a sickly yellow hue. The pain is of a dull aching kind, extending into the forehead, and generally suffering occasional exacerbations, with alternate remissions. The constitutional disturbance varies with the acuteness of the local symptoms. This inflammation may extend to other tissues of the eye and produce destructive effects on them; but when confined to the sclerotic coat, it terminates always in resolution, or in a chronic state approaching to it. When acute, it requires bleeding, leeching, warm fomentations, and purgatives; and when chronic, cupping, followed by blistering on the back of the neck, with small doses of oxymuriate of mercury, Dover's powder, and colchicum, administered internally.

Iritis, and its Consequences.

The Iris is liable to inflammation in consequence of local irritation, and also of indirect causes operating on an unsound constitution. The derangement of the system which seems most favorable to this effect is that resulting from the abuse of mercury in the treatment of venereal diseases; but bad health from original constitutional defect, or from an improper mode of life, may occasion a predisposition sufficient for its production when the exciting circumstances are brought into action. It may also result from the extension of inflammation originating in some other texture, as the conjunctiva or sclerotic coat.

The symptoms are severe deep-seated pain of the eye, extending into the forehead, with more or less fever, according to the intensity of the local affection; the iris changes its color, usually acquiring a dull brick-red hue in part of its extent; the pupil is generally small, fixed, and irregular; the aqueous humor appears turbid; and there is a distinct red zone formed by the enlarged vessels of the sclerotic, at the distance of about a line from its connection with the cornea. The consequences of this inflammation are effusion of lymph on either surface of the iris, which, becoming organized, may cause permanent obliteration of the pupil, and adhesion of the iris to the capsule of the lens or to the cornea. The lymph sometimes exudes in the form of distinct drops, which, when descending to the lower part of the anterior chamber, constitute what is called Hypopion.

In the treatment of iritis, the ordinary means of depletion, etc. are found to be insufficient for arresting the morbid process. The pain and fever may be thus diminished, but they are not removed; and the effusion of lymph proceeds as if no attempt had been made to control the disease. The grand remedy for it is mercury, given so as to affect the system; and if this be done early, while the usual measures for subduing inflammatory action are at the same time employed, and there is no local irritation present, there is almost a certainty of affording speedy and effectual relief. It is well ascertained that the constitutional action of mercury is the most powerful obstacle to the effusion taking place, and exerts the strongest influence in promoting the absorption of lymph which

has been thrown out. In the first instance, blood should be abstracted generally and locally, according to the violence of the symptoms; the bowels should be freely evacuated, and then two or three grains of calomel, with a quarter of a grain of opium, are to be given three times a day, until the mouth is affected, when the quantity of the medicine may be diminished so as merely to keep up a moderate degree of ptyalism. In the second stage of the disease, much benefit is often derived from rubbing the forehead and neighborhood of the eye with a mixture of equal parts of mercurial ointment, opium, and the extract of belladonna. The disease sometimes occurs from the commencement in a chronic form, in which case, leeching, and counter-irritation by blistering on the back of the neck, ought to be conjoined with the mercury.

The permanent effects of iritis improperly treated or neglected, which consist in obliteration of the pupil, sometimes admit of remedy by an operation. The object of it is to make a new aperture in the iris sufficient for allowing the light required in vision to enter; and various methods have been contrived for its performance. The most important of these are—1. Making a simple incision in the closed iris by means of a needle with cutting edges, or a small knife introduced through the sclerotic at the distance of somewhat more than a line from the cornea, and carried forward through the membrane so as to effect its division to the extent required (Cheselden, Sir W. Adams); 2. Tearing away the iris from its ciliary attachment sufficiently for establishing an adequate opening, by means of a curved needle introduced through the sclerotic or cornea (Scarpa); 3. Dividing the iris from its center to the circumference in the direction of two radii meeting together at an angle of 45°, so as to form a triangular flap, the apex of which corresponds to the pupil, and its base to the ciliary attachment of the iris,—a process that may be effected more easily than might be expected, by puncturing the cornea and introducing the blades of very small curved scissors,—one of which is sharp to penetrate the iris, and the other blunt to prevent injury of the cornea (Maunoir); 4. Cutting out a piece of the iris, which is done by puncturing the cornea and allowing the iris to protrude, or, if necessary, pulling it out with forceps, and then removing the portion thus presented by means of scissors curved on the side (Gibson). These methods have been variously modi-

fied and combined, and have led to the contrivance of an endless variety of instruments, the particular description of which will be found in the works devoted to ophthalmic surgery. The one last mentioned is easily performed, is not attended with much risk of the new aperture closing, and is little injurious to the other structures of the eye. The opening of the iris must be made opposite a clear part of the cornea, and the incision of the latter part should not, if possible, be directly over the new pupil, lest the opacity of the cicatrix should throw another obstacle in the way of vision.

Protrusion of the Iris.

When an opening is formed in the cornea, either by mechanical violence or ulceration, the Iris is apt to protrude through it in the form of a round dark-colored tumor of variable size, which is extremely sensitive to external impressions, and consequently causes great irritation. If the protruded part be cut away, it is replaced by another portion; it should therefore be removed by caustic, which may be applied every other day. The nitrate of silver answers best for this purpose; and, by taking off the sensibility of the protruded surface, relieves the patient from pain before the tumor is destroyed.

Dropsy of the Choroid Coat.

The Choroid membrane is liable to distention from the accumulation of a dark-colored fluid, which sometimes contains scales of cholesterine. The sclerotic and conjunctiva are protruded, and becoming thin in consequence of the pressure from within, allow the color of the fluid to appear through them. The use of the eye is sometimes retained, but frequently lost. If the swelling is small, it need not be interfered with—if large, it may be remedied by repeated punctures.

Inflammation of the Retina.

In some cases of inflammation of the eye, the Retina seems to be principally, if not solely, affected. The patient complains of intense deep-seated pain, accompanied with the false perception

of sparks or flashes of fire, while the power of vision is greatly impaired, or altogether suspended. In some cases this defect proves permanent, but in others it disappears, together with the inflammatory symptoms. The most efficient treatment consists in copious depletion, both general and local, with active measures for promoting the intestinal secretions.

Cataract.

The lens and its capsule are liable, together or separately, to opacity, which more or less impedes vision and constitutes the disease named Cataract. The substance of the lens, when thus affected, is sometimes firmer than usual, at other times softer, or even fluid, according to which varieties cataract is divided into hard, soft, and milky. Opacity of the capsule is seated in the anterior layer; when it exists alone, there is usually no lens, in consequence either of congenital defect or removal by operation. Lenticular cataract, when solid, is generally of most firm consistence at the center. Its color is very various, from dark-brown to white when examined through the cornea, but does not exhibit so much difference when removed from the eye, being for the most part grayish-yellow in the firm kind, and bluish-white in the soft or milky cataract. The last mentioned appears larger, and as if occupying the posterior chamber more fully than usual. Capsular cataract has a grayish mottled appearance, and seems as if flattened.

The causes of cataract are involved in great obscurity. It is sometimes congenital, and then consists either in opacity of the anterior part of the capsule, with atrophy of the lens, or in a soft curdy state of the latter. It frequently occurs at an advanced period of life, after the age of fifty, particularly in persons having light-colored eyes, where it is generally of dense structure. External violence, as that of a smart blow on the eye, or the penetration of a sharp-pointed instrument into the lens, frequently induces almost immediately the formation of cataract, which in such cases is usually of a white color and soft consistence. It appears that the substance of a lenticular cataract suffers no change in its firmness during the continuance of the opacity, and that it is either hard or soft from the commencement of the disease.

The symptoms of cataract are—1. A brown, yellow, gray, or white color of the pupil, instead of its usual blackness; 2. Defective vision, from mere dimness to complete blindness, except that the power remains of discerning the outlines of objects held between the eye and the light; 3. Mobility of the Iris, and the absence of symptoms denoting affection of the nervous system.

As the opacity usually takes place slowly and gradually, the indications of it are at first very slight, and increase almost imperceptibly until it is completed. During the progress of the disease the patient sees best in an obscure light, as the pupil then dilates most, and exposes the lens toward its circumference, where the opacity is less, partly from its thinness at this part, and also from the morbid change beginning at the center. Belladonna or other applications that dilate the pupil improve the power of vision, on the same principle, so long as they continue in operation.

A great variety of means have been tried for arresting the progress of cataract, and inducing removal of the opacity by absorption, so as to restore the lens to its natural state. None of these have had the desired effect; and it is now admitted, that the only mode of relieving the patient is to remove the opaque body from the situation in which it impedes the entrance of light. The operations performed with this view may be divided into three kinds: 1. Those which merely alter the position of the lens so as to prevent it from obstructing vision; 2. Those which extract the lens altogether from the eye; and 3. Those which disintegrate the structure of the lens, and expose it to a process, whether of solution or absorption is not well ascertained, but which gradually diminishes its fragments and finally removes all trace of them.

The first of these methods, or Couching, as it is called, may be effected either by depression or reclination. In the former of these the lens is made to descend into the lower part of the eyeball, still preserving its original situation in regard to the parietes of the cavity. In the latter its upper edge is turned backward, so that the anterior surface is directed upward, and the posterior one downward. Various instruments, named couching-needles, have been contrived for performing depression; but the most convenient is the one distinguished as Scarpa's. It is an inch and a quarter long, and slightly curved toward the point, which is sharp. The pupil should be dilated, by the extract of belladonna rubbed

over the forehead or dropped in watery solution into the eye. The patient should be seated, or reclining in a posture perfectly horizontal. The upper eyelid must be elevated by an assistant, who, pressing on its edge with the points of his fore and middle fingers, or a levator if the patient is a child, raises without everting it. The surgeon depresses the lower eyelid with his fore or middle finger, according to the eye operated on, and places the other at the internal angle, so as to press on the white part of the ball, which powerfully counteracts the tendency it has to roll. He then enters the point of the needle, the convex side of which is turned forward about a line and a half distant from the cornea, a little below the transverse diameter of the eye, pushing it suddenly through the coats. Pressing the handle toward the temple, he directs the instrument forward and inward, between the dilated iris and edge of the lens; moves it freely in the anterior chamber, so as to satisfy himself that it has penetrated the capsule; next places it across, so as to make its concavity correspond with a line a little above the transverse diameter of the lens, into the substance of which he fixes its point; and then, by a steady decided sweep of the hand, depresses the opaque body into the lower part of the eyeball, so as to leave the pupil clear and black. He now disengages the needle from the lens by a slight rotatory motion, and, waiting a second or two to see that all is right, withdraws it. If the lens rise after being depressed, before the needle is removed, it must be again carried down; and if it rise subsequently, the operation must be repeated, with an interval sufficiently long to prevent undue irritation. After the operation a piece of lint wet with cold water should be applied so as to cover the eye—the patient should be confined for three or four days to a dark room and to the antiphlogistic regimen—and the signs of inflammation should be carefully watched for, so that no time may be lost in using active depletion and the other means that may be required.

The bad consequences of the operation are acute inflammation, caused by the derangement of structure which it occasions, and a chronic form of inflammatory action, which is not only extremely distressing to the patient, but apt to terminate in blindness, by rendering the retina unable to perform its functions, or leading to effusion of lymph in the interior of the eye. The two last of these

effects are usually ascribed to continued irritation proceeding from the displaced lens pressing on the ciliary processes and retina. The treatment that has been explained, in reference to acute and chronic inflammation, must be employed according to the circumstances of the case.

Reclination is performed in all respects as depression, except that the needle, after being applied to the anterior surface of the lens, is moved directly backward instead of downward. The advantage contended for, in favor of this modification of couching, is the smaller risk of inducing chronic inflammation by the pressure of the dislocated lens, which, however, is more apt to rise again than when depressed.

Extraction of the cataract is an operation which was not practiced previous to the last century. It is effected by making an adequate opening in the cornea, puncturing the capsule, and thus allowing the lens to escape. The advantages of this proceeding are—1. That the lens does not remain to excite irritation; and 2. That no part of the eye is necessarily injured except the cornea, which is not an irritable texture. The objections to it are—1. The risk of wounding the iris, and of allowing the vitreous humor to escape along with the lens; 2. The difficulty of the operation; and 3. The danger of the wound of the cornea not uniting by the first intention, and suppurating, in which case, collapse, with opacity of the eye, are the necessary consequences.

The instruments required for the operation are a knife for cutting the cornea, and a small hook for rupturing the capsule. Richter's and Beer's knives are the best for the purpose. They should increase from the point backward in thickness as well as breadth, so as to prevent the aqueous humor from escaping until the incision is completed, or at all events carried so far that the cornea is transfixed, since the danger of injuring the iris is not so great after this has been done. The hook should be exceedingly small and rectangular, or instead of it a curved needle may be employed. The pupil ought not to be dilated, lest the vitreous humor escape. The patient should be seated or reclining, with his other eye covered. The eyelids are to be separated by a speculum, and the eyeball fixed by catch-forceps. The point of the knife is entered about the distance of a line from the margin of the cornea, a little above its transverse diameter on the temporal side, and pushed

steadily through until it issues at the opposite corresponding part. If the iris comes in the way of the blade, gentle pressure is made upon the cornea; and when the membrane has thus been induced to withdraw itself, the incision of the cornea is completed at an equal distance throughout from the margin. The eyelids are then allowed to close, in order to dilate the pupil. The hook is cautiously introduced under the flap, and directed into the capsule, which should be freely ruptured. The eyelids are again closed, and when they are opened a few seconds afterward, the lens may probably be found lying in the wound, or exterior to it. If it does not soon appear, very gentle pressure may be made on the ball, with the intervention of the upper eyelid. But if any doubts are entertained as to the capsule being ruptured, or the aperture of the cornea being sufficiently large, it is much safer to remedy these defects of the operation by reintroducing the hook in the former case, and a knife or scissors in the latter, than to endeavor to compensate for them by forcibly compressing the eyeball. The after-treatment consists in confining the patient for several days to a dark room, enforcing the strictest antiphlogistic regimen, and employing, without loss of time, the most active means of subduing inflammation if signs of it should appear.

The operation of breaking up the texture of the lens may be performed either through the cornea (Keratonyxis), or through the sclerotic (Scleroticonyxis). In the former way, a small straight needle is the best instrument, and in the latter, if the cataract is soft or fluid, the curved one used for couching, but if it is firm, the edge should be straight and sharp. The pupil ought always to be fully dilated, and the eye as well as the patient prepared for the operation in the manner already explained in regard to couching. The needle should be introduced at the distance of a line from the sclerotic or cornea, according as it is wished to operate anteriorly or posteriorly. It should be directed to the center of the cataract, and made to lacerate its texture as extensively as possible. It has been found that the fragments disappear sooner in the anterior than in the posterior chambers, and therefore they ought to be urged forward into it. The process of amendment goes on a long while, extending to weeks and months after this operation, but one or more repetitions of it are frequently required before the cure is completed. As the irritation produced is gen-

erally very inconsiderable, this is of little consequence. If a large fragment of the lens, or the whole of it, escapes into the anterior chamber, though solution may take place, there is great risk of such severe or continued irritation as may require its extraction through an opening cut into the cornea.

In relation to the choice of these different methods of operating, it may be observed that the introduction of chloroform has greatly facilitated extraction, and divested it of the objections to which it was formerly exposed, while its advantages in cases of hard cataract remain of unquestionable superiority.

Malignant Diseases of the Eyeball.

Cancer rarely originates in the eye, though it occasionally extends to it from the neighboring parts. But medullary sarcoma occurs in it more frequently than in any other part of the body, except the bones, mamma, and testicle. Infants are chiefly subject to its attack, but adults occasionally suffer from it. The retina is generally the part first affected, but in the progress of the disease all the textures entering into the formation of the eyeball become involved. The first symptoms are blindness, and a greenish or dusky-red color of the pupil. Then the eye protrudes, sometimes remaining entire, at other times ulcerating, and allowing a fungus to issue. The patient becomes weak and emaciated, loses appetite, and acquires the greenish-yellow complexion characteristic of malignant action. The disease varies in the time required for its course from months to years, being usually most rapid in young, and slow in adult persons, but always terminates fatally.

The only remedy that affords any chance of relief, is excision of the eye before the morbid process has advanced so far as to render the removal of the whole tumor impracticable, and even then the prospect of a permanent cure is extremely unfavorable, as there is hardly any well-authenticated case of its being accomplished. In performing the operation, the commissure of the eyelids at the outer angle should be divided, in order to gain more room to dissect out the tumor with a knife or scissors, guided on the fore-finger of the left hand, which being interposed between the morbid surface and the edge of the instrument, insures the complete excision of the diseased mass. The orbit should be

filled, but not stuffed, with lint; and, if the blood continues to flow, cloths wet with cold water may be applied over the face. When suppuration commences, the lint ought to be withdrawn, and replaced by a little simple dressing. The cavity granulates and contracts, but the cure is tedious, and too frequently, before cicatrization is far advanced, the morbid growth reappears.

The eyeball is now frequently removed, not in cases of malignant disease, but merely on account of the organ being unfit for vision and unseemly in appearance—the perfection to which artificial substitutes has been brought rendering their employment greatly preferable to such a condition. For this purpose, by means of scissors and forceps, the conjunctiva should be separated round the cornea, so as to expose the tendinous attachments, which are divided close to the sclerotic, and the optic nerve being lastly cut through, the eyeball is removed without any further disturbance of the orbit. The conjunctiva thus preserved covers the sort of cup that remains, and the healing process proceeds so quickly that in the course of a week or two, or even by the end of a few days, the substitute may be introduced and worn with perfect comfort.

Tumors of the Orbit.

Medullary or cartilaginous growths from the bones, polypous excrescences from the nose, and tumors of independent origin, are occasionally met with encroaching on the cavity of the orbit, and causing a correspondent protrusion of the eye. Vision is generally impaired or destroyed by the stretching of the optic nerve thus occasioned, but is regained when the eye returns to its place, unless the organ has participated in the morbid action. Before resolving on the removal of an orbital tumor, it is necessary that its nature and connections should be carefully investigated, in order that an attempt at excision may not be made unless the morbid part can be completely extirpated. Fatty, fibrous, and encysted tumors must be completely dissected out. Polypous excrescences ought to be treated according to the principles that will be explained in relation to the nose; and growths from the bone should not be interfered with unless they proceed from the malar or superior maxillary portion of the orbit, so that the root is within reach.

Eyelids.

The eyelids are subject to a chronic inflammation named *Ophthalmia Tarsi*, which chiefly affects their external edge at the roots of the cilia. The tarsal margin is swelled, red, and the seat of disagreeable itching. The eyelashes are small, or altogether absent. The eye is weak and watery. Children, especially those of scrofulous constitution, are most liable to this complaint, which generally proves extremely obstinate, in recurring again and again during the period of childhood up to puberty, though relieved for a time by the remedies that are employed to remove it. Stimulating ointments, such as those containing the red oxide of mercury or the nitrate of mercury, are the best local applications, and should be rubbed along the margin of the inflamed eyelids at bedtime. Great attention ought to be bestowed on the maintenance, or restoration, of the various secretions, particularly those of the skin and intestinal canal; and counter-irritation, by blistering the back of the neck, or introducing a seton into it, is often very serviceable.

The upper eyelid, and also, though much more rarely, the lower one, is liable to inversion of the margin, which is named Entropium. This occurrence is usually in the first instance caused by the swelling attendant upon *ophthalmia tarsi*, and afterward tends to its own increase, as well as obstinacy, by the irritation which proceeds from the friction of the eyelashes upon the eyeball, and also from the tarsal cartilage requiring a correspondent curvature, which opposes the return of the eyelid into its proper position. Tumors of the eyelid, and sometimes mere relaxation of it, lead to the disease. It occasions constant uneasiness, and in consequence of this, chronic inflammation of the conjunctiva, nebula, arborescent red vessels, and ultimately complete opacity of the cornea are sooner or later produced.

The treatment is conducted with the view either of palliating or radically removing the disease. The former of these objects may be attained by pulling out the cilia from time to time, or applying straps of plaster so as to maintain the eyelid in its proper place. As such means are very troublesome and ineffective, much attention has been bestowed on the radical cure, and

various modes of procedure devised for its completion. The principle on which these are founded is, to counteract the tendency to turn inward, by removing a portion of the integuments of the eyelid so as to tighten or tuck up its external edge. This may be done either by cutting, or applying escharotics; but the former method is unquestionably preferable, since the latter, though recommended by some respectable authorities, is infinitely more painful, tedious, uncertain, and inefficient. The redundant skin is cut away with scissors much more conveniently than with a knife, the requisite portion being embraced between the blades of a pair of dressing forceps, and removed at one stroke. It should in general extend from within a line of the edge of the eyelid, or roots of the cilia, to the same distance from the lowest hairs of the eyebrow, and reach the whole length of the eyelid, so that the form of the raw surface may appear nearly round when the eye is closed. Scissors of the usual form are quite sufficient for the purpose, but they prove more convenient when curved on the side. The cut edges must be brought into accurate contact by stitches of the interrupted suture, introduced at the distance of a quarter of an inch from each other. The wound heals by the first intention, and leaves hardly any vestige of its existence. In very aggravated cases it has been found necessary to divide the eyelids at their external commissure, in order to obtain sufficient relaxation for effecting the requisite eversion.

By Trichiasis is understood a morbid state which produces nearly the same symptoms as entropium, but depends upon somewhat different circumstances. It seems to consist in an improper direction of the eyelashes, which, instead of defending the eye, turn inward upon it, so as to cause constant irritation. Attempts have been made to remedy this, by pulling out the cilia, cauterizing their roots, and cutting away their secreting bulbs, or even the whole edge of the eyelid; but all these means are very ineffectual, and, at the best, afford only a temporary relief. The only method of curing the disease is to treat it like entropium; and, by effecting a very decided eversion of the ciliary margin, prevent the eyelashes, though still possessing their improper direction, from touching the surface of the ball.

Ectropium is an opposite condition, chiefly affecting the lower eyelid. In this case the edge is turned outward, exposing the

lining membrane to external irritation, presenting an unseemly appearance, and allowing the tears to run over the cheeks. The causes of this eversion are thickening or excrescence of the inner surface, relaxation of the orbicular muscle, and the contraction occasioned by the healing of sores in the integuments. The treatment must of course be varied according to these different circumstances. If the disease depends merely upon a thickened state of mucous lining of the eyelid, touching it occasionally with nitrate of silver or concentrated sulphuric acid, or shaving away a portion at once with curved scissors, are the means usually employed. If the eyelid is preternaturally relaxed, a V-shaped piece may be cut out of it, and the edges then united together by one or two pins; and if the edge is drawn outward by a cicatrix of the integuments, the contraction should, if possible, be cut out, so that the lips of the wound may be united together directly.

Encanthis is a tumor which sometimes presents itself at the inner angle of the eyelids. It has a fleshy consistence, and tubercular surface. The color is generally pale red, but sometimes very dark, and almost black. It grows from the *caruncula lachrymalis*, and by its pressure not only causes a disagreeable deformity, but impedes vision, and also the motion of the eyelids. The remedy consists in excision, which may be performed either with a knife or scissors, care being taken to stretch the attachments of the tumor by pulling it out with a hook or forceps, so as to prevent any chance of cutting the lachrymal ducts, which lead from the puncta to the sac.

Encysted tumors are often met with in the eyelids, particularly the upper one. They are sometimes seated immediately under the skin, and may be removed by dividing it to the requisite extent and then dissecting out the cyst. Much more frequently they lie deeper, and adhere to the mucous lining of the eyelid, which is discovered by their immobility, and the appearance presented by the inner surface of the eyelid when it is brought into view by being everted. The part with which the tumor is connected has a yellowish color, streaked with red, from the arborescence of vessels over it, and seems flatter than the neighboring surface. In this case the extirpation could not be accomplished by cutting externally without making a breach through the

eyelid, and the proper method is to remove an elliptical portion of the sac from within and squeeze out its contents. The best way of doing this is to evert the eyelid, transfix the sac with a hook, and then cut out a portion of it with a sharp-pointed knife.

Cancerous ulceration sometimes affects the eyelids; and, as excision of course affords the only effectual mode of remedy, it is important to determine how far these coverings of the eye may be removed without incurring the necessity of removing the eye itself. It appears that the whole of the lower lid may be taken away without almost any inconvenience, and that a large part of the upper one may also be extirpated without depriving the eye of its necessary protection from external irritation. But if the whole or a considerable part of the upper eyelid required removal, it would be necessary to take away the eye along with it, as the patient could not otherwise avoid suffering extreme distress from the exposure of the organ until it acquired a cuticular covering, which, while it afforded protection against irritation, would effectually destroy the power of vision. It will seldom be necessary, however, to cut out a sound eye on this account, as when the cancer is so extensive as to require removal of the whole or greater part of the upper lid, it almost always extends to the conjunctival covering of the ball.

Obstruction, Abscess, and Fistula of the Lachrymal Passage.

The duct which discharges the tears into the nose is apt to become obstructed at its inferior orifice, so as to impede or altogether prevent the fluid from descending. This usually occurs in persons who have been previously suffering from chronic inflammation of the conjunctiva or *ophthalmia tarsi*, and it has consequently been ascribed to the accumulation of thick mucous matters resulting from the morbid secretion thus produced. It seems more reasonable to suppose, that, by an extension of diseased action, the lining membrane of the nasal duct swells so as to contract or close the canal. The distinctive symptom of obstruction is distention of the lachrymal sac, forming a flattened round tumor at the inner angle of the eye, lying under the tarsal ligament, and hence often appearing as if bilobated. It is immov-

able, and when subjected to pressure usually diminishes or disappears, the contents being either forced downward through the duct, which remains pervious though contracted, or upward through the *puncta lachrymalia*. When the secretion of the tears is excited by mental emotion, or external irritation, such as that caused by a cold wind blowing on the eye, they run over the cheeks more copiously than in ordinary circumstances, and the patient frequently complains of a disagreeable feeling of dryness in the nostril.

The treatment of Epiphora, as this morbid condition of the lachrymal passage has been named, is conducted on different principles, according to the view that is entertained of its origin and cause. There can be no doubt that a diseased state of the eyelids, whether regarded as leading directly or indirectly to the obstruction, ought to be remedied if possible without delay. It is then proper to introduce small gold or silver probes through the puncta in order to clear the passage. The canal should be slit open (Bowman) to allow the entrance of a larger instrument than could be admitted by the orifice. By gently urging and alternately pushing or withdrawing a little, it is at length introduced into the nose. By repeating this operation, and using probes of larger size in succession, relief may be afforded. The introduction of probes from the nose into the duct, though very easy in the dead body, is hardly practicable in the living, especially when the entrance to the passage is obstructed. Injections thrown in through the puncta, by means of Anel's syringe, are of so little avail that they need not be particularly considered.

If the disease prove so obstinate and troublesome as to make the patient willing to suffer the pain and inconvenience attending the following operation, it ought to be performed. The object is to remove the obstruction and prevent its reproduction. With this view an incision is made into the lachrymal sac by pushing a sharp-pointed knife into it, immediately below the ligament that extends from the inner commissure of the eyelids to the nasal process of the maxillary bone. After the point has been fairly introduced into the sac by pushing it backward and inward, the handle must be raised so as to alter the direction of the blade, and push it downward into the duct. A thick probe should then be passed through the opening, down the duct into the nose.

The obstruction having thus been removed, a piece of bougie, or a small metallic instrument named a style, is introduced. The style may be made of silver, lead, or any other metal not readily oxidized; it is suited to the form of the passage, and has a broad head to prevent it from descending too far. It should be taken out daily, washed, and replaced. So long as it is worn, the patient is relieved from the inconvenience he formerly suffered, but when it is withdrawn, the passage is apt to close again. Trials may be made from time to time, at the interval of six or eight weeks, to ascertain whether or no the foreign body can be dispensed with.

When the obstruction is permitted to continue, it sooner or later occasions suppuration of the sac, and the abscess thus formed being opened naturally or artificially, allows the tears to issue on the cheek, in which case there is produced what may be more strictly named a *Fistula Lachrymalis*. The neighboring integuments become thick and red; the eye is weakened; and the patient suffers so much from the deformity and inconvenience resulting from the disease, that he readily submits to the operation required for his relief. This does not differ from the one that has been described for epiphora. It was formerly the custom to apply the actual cautery, through a canula introduced into the entrance of the duct, in order to destroy the diseased parts which were thought to oppose recovery; but this practice is now obsolete.

CHAPTER XXIII.

MOUTH.

Salivary Glands.

The ducts of both the parotid and submaxillary glands are liable to become the seat of calcareous concretions, which are named Salivary Calculi. Their composition is phosphate of lime, agglutinated by a small quantity of animal matter. They have usually a yellowish-white color, oval figure, and finely-tuberculated surface. They vary in size from that of a millet-seed to that of an almond with the shell. In the parotid duct they are very rarely met with, but in that of the submaxillary not unfrequently. They occasion pain, swelling, and hardness, and sometimes give rise to the formation of an abscess. In the parotid duct, the symptoms thus produced are apt to be confounded with those of rheumatism, toothache, gum-boil, or suppuration of the maxillary antrum; while under the tongue they may be occasionally mistaken for those of encysted tumors. In all cases of doubt, it is right to search the duct with a probe, and to feel for the calculus by pressing on the place where it is suspected to be. So soon as a free incision is made, the concretion escapes, together with the fluid accumulated about it. The usual situation of these concretions is immediately within the orifice of the ducts; but they have also been found imbedded in the substance of the submaxillary gland, where they excited an increased and unhealthy secretion, with general swelling and hardness of the gland. In such cases the calculus, if distinctly recognized, may be extracted by cutting down upon it, from the mouth, which I have had occasion to do.

When the Parotid duct is included in a wound of the cheek, unless the edges of the integuments be very closely approximated, a salivary fistula is apt to remain at the part. In case it should take place, the patient will labor under the double annoyance of

dryness of the mouth during mastication, and a discharge of fluid on such occasions from the preternatural orifice. The use of soft or fluid food, and pressure applied to the gland, afford some palliation of these complaints; but the radical cure of them requires the re-establishment of a passage into the mouth, and obliteration of the external aperture. Both of these objects may be obtained by introducing a small seton through the cheek, from the fistula, into the mouth, withdrawing it after the lapse of a few days; and then, having rendered the edges of the external opening raw by paring them with a knife, uniting them together by means of the twisted suture. Until the cure is completed, the patient should subsist on fluid articles of nourishment, and abstain from moving the jaws by speaking, or any other exercise of them.

The neighborhood of the parotid gland is frequently affected with diffused inflammation and suppuration of the cellular substance, which, owing to the presence of a thin but dense fascia lying over this part of the face, does not form a prominent tumor, and spreads extensively instead of pointing. The patient in consequence suffers great and protracted distress, until an incision is made to let the matter escape.

Morbid growths also often occur here, and by causing absorption of the parotid in proportion to their own enlargement, at length sometimes completely take the place of the gland. These tumors are generally of the fibrous kind, frequently containing cysts in their substance, and tending at length to assume the medullary sarcomatous action. Blistering and iodine ointment occasionally check the increase, or even excite the removal by absorption of enlargements in this situation; but when they prove obstinate, the only remedy for them is the knife. If the morbid mass is deeply seated, it is necessary, in effecting its removal, to avoid cutting the common trunk of the temporal and internal maxillary arteries, and also the *portio dura*, or facial nerve, the consequence of which is an unseemly and distressing paralysis of the face. A very free incision of the integuments should be made to facilitate the subsequent dissection. After the whole of the external surface of the tumor has been exposed, its anterior edge should be turned back by degrees, as the subjacent connections are divided, which ought to be done by cutting upon the tumor so as to divide the connecting cellular substance, without endanger-

ing the neighboring parts by carrying the knife parallel to the surface of the tumor. The arteries that require ligatures are to be tied, and as a troublesome oozing of blood is apt to take place from the glandular substance of the parotid, a piece of lint or sponge should be placed over the wound.

Tumors are occasionally met with under the tongue, varying in size, and producing accordingly more or less inconvenience. Of these the most common is named Ranula. It consists of a sac containing fluid, which is usually thick and glairy like the white of eggs, but sometimes is watery, or of a pultaceous consistence, like that of porridge or boiled rice. Hardly any limits can be assigned to the extent of such formations, if allowed to increase without interference. The tongue is impeded in its movements—articulation and deglutition are rendered very difficult—the cavity of the mouth is completely occupied by the tumor—and it also appears under the chin. The swelling is generally attributed to distention of the submaxillary duct, owing to obstruction of its orifice, but really depends on the presence of an encysted tumor. The treatment it requires is excision of an oval piece of the cyst, together with the superjacent mucous membrane, which may be easily effected by means of a hook and knife, or pair of curved scissors. The cavity suppurates and granulates, and if the lining membrane is very thick, or slow in taking on a proper action, it may be touched with caustic. In some cases I have succeeded in removing the whole of the cyst, so as to prevent any delay in healing from its presence.

Fatty tumors occasionally grow in the situation of ranula, and present characters so similar as to be distinguished from it with difficulty by external examination. The best way of deciding the question is to make an incision, which, in the event of the swelling proving solid, may be extended sufficiently for its removal.

The Lips afford subject of surgical treatment chiefly on account of congenital malformations and cancerous ulceration. The former of these are usually comprehended under the title of Hare-Lip. They consist in fissures of the upper lip, varying in extent and number, and either simple, or more or less complicated with malformation of the jaw and palate. The simplest form in which they are presented is that of a single fissure, extending from the

edge of the lip to its connection with the gum, and seated a little to one side of the mesial plane. In double hare-lip, there are two such fissures, with an intermediate portion of lip, which varies in size. The imperfections of the palate consist in a longitudinal split or division, which is either confined to the soft part, or extends throughout the whole partition between the nose and mouth. This Split Palate may exist independently of hare-lip, but rarely does so. The malformation to which the jaw is liable consists in a projection of the central part that holds the cutting teeth, forming a tumor from which the teeth grow out at an angle to their ordinary direction. In most cases of this kind the projection comprehends an equal portion of both superior maxillary bones—the portion, namely, which in the lower animals is occupied by two distinct bones, the *ossa incisiva* or *intermaxillaria*. It forms a round knob, connected by a narrow neck to the septum of the nose, covered with a firm substance, similar to the gum, and having at its anterior part a similar shaped but smaller sized appendage, consisting of the tissue that should have constituted the lip. The fissures on each side of this knob meet together behind it, and are then continued through the palate backward. Instead of this conformation there is sometimes merely an overlapping of one edge of the split gum over the other, and the degree to which the projection thus formed takes place is extremely various.

The impediments to deglutition and articulation, and the deformity which results from these imperfections, render their complete and early reparation very desirable; but several circumstances in respect to the age of the patient must be taken into consideration before any operation for this purpose is attempted. Infants before the sixth month, especially if weak or irritable, are apt to die from convulsions or exhaustion occasioned by the hemorrhage which attends it; and, besides this danger, there is another of less magnitude, which is the risk of union between the edges of the lip not taking place properly. Between the sixth and twelfth months the process of dentition is unfavorable for the operation. The surgeon, therefore, if he has his choice, should not operate before the child is two years old, and in no case ought he to do so before the fifth month, or during the process of dentition, until all the incisors at least have appeared.

So long as the child is at the breast the operation, of course, cannot be performed; and it must consequently be weaned, if an early attempt at reparation should be determined on. When the jaw is preternaturally projecting, the prominent portion must be either reduced to a proper level by continued pressure, or removed by the knife. If of small extent it may be treated in the former way, but if at all considerable it requires the latter; and it is evidently proper to execute this preliminary part of the process as soon as possible, in order to render the condition of the lip more favorable for union when the time for attempting it arrives.

The operation must be varied in some respects according to circumstances, but always essentially consists in joining the edges of the lip after making them raw by paring the respective surfaces. This may be done by means of scissors, or by embracing the lip between the blades of forceps and shaving off the portion of the edge that is allowed to project beyond them, or lastly, by seizing the edge of the lip by catch-forceps while it is held between the finger and thumb of an assistant, transfixing it with a knife a little above the angle where the two edges meet, and then removing a slice of the requisite extent or thickness. This last-mentioned mode is on many accounts the one that ought to be preferred, and particularly because it enables the operator to regulate the shape of the cut surfaces more accurately than any other. The margins of the fissure present a convex outline, which, if allowed to remain, would cause the edges, when joined, to form an unseemly angle in the lip at their point of meeting. The respective surfaces should therefore be made straight, or rather slightly concave, so that when brought together they may give the lip its natural fullness, and the lip should be very freely separated from the gum on both sides of the fissure. The two raw surfaces are next united by means of silver sutures, of which three are generally required. They may be taken out on the fourth day after the operation, but the cheeks should be supported for a week or even longer by a strap of adhesive plaster placed across the face.

In cases where there are two fissures, the intermediate portion of skin would not reach the margin of the lip, so that both of its edges should be made raw at the same time; three sutures being

then introduced, one at the margin of the lip, one near the nose, and one in the middle passing through the apex of the triangular piece.

Fissure of the soft palate may be united in favorable cases by an operation similar to that for the hare-lip, but which is uncertain of execution, owing to the situation of the parts, their mobility, and the involuntary efforts of the patient. It would be impracticable, except in adults possessed of considerable fortitude, and in cases where the state of the parts is favorable to union, the difficulty of course increasing with the width of the breach. The edges may be made raw by means of either the scissors or the knife, the latter of which is the most convenient. Silver sutures must be introduced, and for this purpose various instruments and modes of procedure have been contrived. The best means on the whole appears to be the simple curved surgical needle with a fixed handle, which should be made to perforate the palate from without inward—first on one side and then on the other—so as to convey a thread through each, and the two ends corresponding with the posterior surface having been tied together so as to form a single thread, the wire may be attached to it and drawn through. The patient for some days after the operation must abstain from food, except what is absolutely necessary, and this should be of a fluid kind. Several repetitions of the process have repeatedly been required to complete the union of the whole fissure, and therefore the failure of one attempt or more ought not to occasion discouragement. Small apertures in the soft palate resulting from ulceration may be closed by repeated applications of the cautery to their margins. Cutting the muscles of the palate as a preliminary to the operation is no more required than cutting the muscles of the cheek for hare-lip.

Fissure of the hard palate was formerly regarded as irremediable, except through the insertion of a metallic plate to supply the deficiency. But it is now ascertained that if the soft parts are separated on each side from the bone so as to be sufficiently relaxed for uniting together, they may be united, and thus enabled to fill the vacant space with bone, through the ossific power of the periosteum in its new position.

Cancer of the Lip.

Cancerous ulceration frequently occurs in the under lip, but hardly ever affects the upper one, except by extending to it from the other, which seldom happens. This difference probably depends on the greater or more frequent irritation to which the lower lip is exposed by its situation and mobility. The disease rarely commences before middle age, and is met with more frequently in males than in females. It originates in different ways, at one time being preceded by a hard warty excrescence possessing the carcinomatous texture, and at another appearing first in the form of a superficial chap or excoriation. The cancer, once established, increases progressively, but with variable rapidity, being attended with burning or lancinating pain, and surrounded by a remarkable induration. The aspect of the sore is extremely various, but always dissimilar to that of a sound granulating surface. All sorts of applications and modes of treatment, except removal of the diseased parts, are found quite unavailing; but, in proceeding to this extreme measure, it is necessary to beware of regarding, as cancerous, ulcers not possessed of malignant action, and obstinate merely on account of the peculiar circumstance of their situation. Ulcers occurring on the lip at or before middle age may often be traced to the influence of local irritation, proceeding from the motion of the part or the asperities of the teeth; and in all cases, unless the cancerous characters should be very distinct indeed, it is right to try the effects of rest by confining the lip with a bandage, and of removing any sharp points of the teeth that may be found to project by filing or extracting them. While this trial is made, the sore should be dressed with black-wash, or solution of the sulphate of zinc, care being taken at the same time to remedy any derangement that may be discovered to exist in the state of the general health.

If it is determined to remove the sore, there can be no hesitation in choosing excision as the best mode of doing so. Caustic of different kinds has often been used, but, besides being tedious and painful in producing its effect, it is always apt to aggravate the disease by eradicating it imperfectly, and irritating the part which is allowed to remain. The method of excision generally

followed is to cut out a triangular or V-shaped piece of the lip, by making an incision obliquely downward on each side of the ulcer, so that the one may meet the other at an angle sufficiently acute for permitting the cut surfaces to be brought together and united, as in the operation for hare-lip. When the cancer is of no great extent, and the lip possesses considerable fullness, this procedure is very convenient, and renders the resulting deformity little perceptible. But when a large part of the surface of the lip is affected, there would then be removed so great a portion of the sound structure as must prevent or very much impede the union of the cut edges. In such cases, the method proposed by M. Richerand is certainly to be preferred. It consists in cutting away the morbid part alone with curved scissors, after which the skin and mucous membrane may be stitched together. Ulcers extending over almost the whole surface of the lip may in this way be completely excised, with hardly any deformity or inconvenience. On all occasions the surgeon should take care that the whole of the induration surrounding the sore is removed, and he ought to abstain from operating when the glands under the chin, or in the neck, are affected.

Tongue.

The tongue is liable to ulceration in consequence of chronic derangement of the digestive organs,—the injurious effect which is produced on the system by the excessive use of mercury,—and the influence of local irritation, such as that proceeding from sharp points of the teeth. In the first of these cases, the ulcers are generally small, round, and yellowish-colored; they are seated chiefly on the edge and inferior surface of the organ, which usually appears somewhat swollen and marked with the shape of the teeth. Their remedy consists in an alterative course of diet and medicine, together with some astringent application, such as powdered borax or alum. The ulcers that are met with in persons whose constitutions are vitiated by mercury present a bluish color, and are extremely irregular in shape. They affect the edge of the tongue especially, and appear in the form of chaps or superficial excoriations. The sulphate of copper used once a day, either solid or in solution, is the best local application; and the

gradual improvement that takes place in such states of the system, through time and a proper mode of living, must be trusted to as the means of affording permanent security against their continuance or recurrence. The sores which result from the irritation of the teeth occur, of course, at the part exposed to its operation. They present various appearances, according to the circumstances of the case, but are easily recognized by the existence of a tooth presenting a sharp edge in their neighborhood. The treatment obviously requires immediate removal of the irritation, by smoothing the rough surface of the tooth, or extracting it; and advantage is also derived from touching the ulcer with nitrate of silver, or the sulphate of copper, in order to destroy its morbid sensibility.

Cancer of the tongue is occasionally met with chiefly at advanced periods of life, but also not unfrequently at an earlier period. It is attended with the usual characters of hardness and pain, and leads to similar disease of the glands of the neck. The only remedy is extirpation, and this unfortunately can seldom be effected with advantage, owing to the diffusion of the morbid tendency. When the cancer is seated on the apex or edge of the tongue, it may be safely cut out with the knife or scissors, after being grasped and forcibly stretched by means of a hook or hooked forceps. But the result of experience forbids almost any hope of effecting permanent relief by extirpating cancer even of this part, and, of course, if possible still less when the disease is seated further back.

The Frænum of the tongue is sometimes originally formed so as to present the appearance of a narrow white band when the apex is turned backward, and more or less impedes the motions of the organ. This imperfection is easily remedied by cutting the edge of the tight frænum, and then rupturing the remaining part of it as far as seems necessary, by pushing the tongue backward. When children are late of beginning to articulate, whether this be owing to mental weakness or any other cause, the relatives are apt to suppose that the frænum is confining the tongue, and it is necessary to be cautious in acceding to their wish of having it divided, as the raninal arteries might be opened by making an incision for this purpose in a natural state of the parts.

The tongue is liable to a general enlargement of both a chronic and an acute nature. The former occurs in children; and, indeed, is probably always congenital, although apt to be overlooked at an early stage. It gradually increases until the organ may be so enormously enlarged as to protrude from the mouth to the extent of several inches, with a corresponding degree of thickness and breadth, so that the teeth are displaced, and the jaw even becomes altered in shape. The treatment requires pressure together with astringents, such as the sulphate of copper, and, if necessary, after the use of these means, excision of the redundant portion. The acute form of the disease is very rare. It possesses an inflammatory character, and not only occasions great inconvenience by impeding deglutition and articulation, but has even proved fatal by causing suffocation. The most effectual remedy consists in making two or three deep longitudinal incisions into the upper surface of the distended organ. Relief is thus very speedily obtained; but if it should not be so, soon enough to protect the patient from the risk of suffocation, tracheotomy ought to be performed without delay. In cases of less urgency, leeches and fomentations applied to the throat prove sufficient.

Tonsils.

The morbid conditions to which the tonsils are chiefly subject are inflammation, suppuration, ulceration, and chronic enlargement.

Inflammation of the tonsils constitutes the most common kind of sore throat, *Cynanche Tonsillaris*. It is induced by exposure to cold,—is recognized by pain and swelling in the region of the glands, particularly observable during deglutition,—and is remedied by general or local bleeding, cathartics, and, after the intensity of the symptoms has been subdued, counter-irritation.

When suppuration takes place the matter is not confined to the gland, but extends into the surrounding cellular substance, and forms a diffused tumor of the fauces, which depresses the palate, renders swallowing almost impossible, and sometimes interferes with respiration also. If the disease be allowed to follow its course, evacuation of the matter is accomplished sooner or later by the natural process; but, in order to hasten the

patient's relief, and prevent the risk of suffocation that might attend the fluid escaping into the throat while the patient is not prepared for it, as during sleep, it is right to puncture the abscess. In doing this, the situation of the carotid artery must be kept in mind, as it would be exposed to injury, if the knife were directed outward, in the line of the ear. If it is introduced a little nearer the mesial plane than the wisdom tooth, and pushed directly backward, there will be no possibility of wounding the vessel; and it seems safer to proceed on this principle than to confide in the instrument which has been in use for this particular purpose, consisting of a lancet blade inclosed in a canula, from which it may be protruded, more or less, by means of a screw at its other extremity.

Ulceration of the tonsils is sometimes of an acute, but much more frequently of a chronic nature. Astringent gargles, and attention to the general health, are sufficient for its remedy in ordinary circumstances; but when obstinate, it must be treated more actively, by touching the surface every day or two with a strong solution of the sulphate of copper, or some other application powerful enough to change the morbid action. Along with these local measures an alterative course of medicine and diet is frequently required.

Chronic enlargement of the tonsils generally results from one or more attacks of inflammation in childhood, and tends to disappear after the period of puberty. In most cases both of the glands are enlarged, but one, in general, exceeds the other in size. The swelling is firm in consistence, pale in color, but often streaked with vessels, and unequal on its surface. There is great variety in the extent which the swelling attains, from the slightest perceptible fullness to a magnitude that leaves hardly any space between the two tumors. The symptoms are—uneasiness in the throat, huskiness of the voice, noisy respiration, which is generally performed with the mouth open, and sometimes deafness, from obstruction of the Eustachian tubes. But what usually occasions the patient greatest annoyance, is the frequency of sore throat to which the morbid state of the gland exposes him.

The ordinary treatment for sore throat affords some palliation of this disease, but the only effectual remedy of it consists in removing a part of the tumor. Caustic, the cautery, and the

ligature, though they have all been often employed for this purpose, are decidedly less eligible means than the knife. The two first are tedious and painful in their operation; and the ligature, while it is liable to these objections, is also attended with great difficulty in its application, owing to the depth of the parts concerned, and the involuntary resistance of the patient. The only ground of declining excision is the apprehension of hemorrhage; but, if the cutting instrument is kept parallel with the great vessels, there cannot be the slightest risk of this. It is not necessary to remove the whole of the tumor, since the portion that remains is soon diminished by absorption, so as to occasion no further inconvenience. Curved scissors might be supposed the most efficient instrument for this operation, but on trial are found not to be so. They can hardly be made to cut through the whole thickness of the mass at one stroke, and it is extremely difficult to make a second, owing to the struggles which are induced by the bleeding. The tumor thus partially detached, hangs down into the pharynx, where it excites irritation that causes coughing or retching, and it has even happened that death resulted from this circumstance. The easiest and safest method is to seize the tumor with hooked forceps, and having put it on the stretch, to cut away as much of it as seems necessary with a probe-pointed slightly-curved bistoury.

Teeth.

The teeth generally begin to appear in the mouth between the seventh and tenth months, and present themselves in the following order: 1. The two front incisors of the lower jaw; 2. The four incisors of the upper jaw; 3. The two lateral incisors of the lower jaw; 4. The four anterior grinders; 5. The canine; and 6. The four posterior grinders. The process of dentition, particularly that part of it in which the teeth, by pressing upon the gum, induce absorption of it, and thus form a breach to allow their protrusion, is attended with irritation, which varies in degree, and produces effects of corresponding importance, both local and general. Uneasiness of the mouth, swelling and pain of the gums, inflammation of the eyes, and eruptions of the skin—particularly that of the head—diarrhœa, convulsions, and fever are the symptoms most frequently observed. Soothing measures, such as the

warm bath and gentle opiates, ought to be employed for allaying them, and whenever they are at all severe, the gum should be freely scarified where the teeth are supposed to be pressing on it. A convex-edged instrument answers best for this purpose, and it ought to be carried fairly down to the teeth in two directions, so as to make a crucial incision.

When the teeth decay so as to lay open the internal cavity and expose the sensible pulp to external irritation—pain, or Tooth-ache, as it is called, usually commences. It is not constant, and varies extremely in the degree of its severity. Various irritations besides those of a local kind induce its fits, or occasional attacks, such as cold operating on the surface of the body, derangement of the digestive organs, or anxiety of mind. Pregnancy is observed to favor their occurrence. The process of decay which leads to this complaint may often be averted by scooping out the dark-colored part of the tooth that surrounds the cavity, and filling the hollow with gold or silver foil, or gum mastic. Opium in substance or solution, some essential oils, as that of cloves, chloroform, and also the strong mineral acids, when introduced into the hollow, often procure temporary relief from suffering; but in general the only effectual remedy is extraction of the tooth affected. This operation is best performed by means of powerful forceps, of which the blades are short, concave, and placed obliquely in regard to the handles. Many ingenious apparatus have been contrived with the view of pulling the teeth perpendicularly from their sockets; but a little attention to the shape and direction of the fangs will render it evident that this mode, granting it to be practicable, would not be convenient. In order to dislodge the roots, it is often necessary that the alveolar processes should be broken more or less; and the best way of accomplishing this is to draw the tooth toward that side which makes the least resistance, at the same time raising it from its bed. The forceps, in the hand of one not practiced in their use, are apt to detach the crown of the tooth from its fangs, and must therefore be employed with caution.

After the process of decay has proceeded so far that the roots of the tooth alone are left, the patient is relieved from toothache, but exposed to other symptoms of a troublesome kind, in consequence of the irritation caused by the stumps, as they are called.

These useless remnants become loosened in their connection with the jaw, and are apt to occasion similar effects to those which would proceed from foreign bodies in the same situation. Inflammation of the gum, leading to abscess (gum-boil or parulis), suppuration of the cheek, followed by fistulous ulcers opening externally, ulceration or purulent discharge of the nasal cavities, sore throat, and disorder of the digestive organs are the most common of these; and their mere mention will be sufficient to show the importance of removing the stumps of decayed teeth. This is done by means of an instrument named a punch, which should be forcibly pushed into the socket close to the stump, in a perpendicular direction, and then, by moving the handle to one side, made to loosen and elevate it.

Hemorrhage occasionally occurs to a troublesome or even alarming extent after the extraction of teeth or stumps. The best application is dry lint forcibly pressed into the cavity, which proves much more effectual than the use of caustic or the actual cautery.

Abscess of the Antrum.

The cavity of the maxillary bone is liable to become the seat of abscess in consequence of the lining membrane taking on a suppurative action. The fluid escapes partially into the nasal cavity when the head is laid in the horizontal posture, but the outlet thus afforded is not sufficiently free to allow the parts to return to their healthy state. The bone is gradually expanded, so as to elevate the cheek and depress the palate; dull aching pains are felt at uncertain times throughout the face and head; and the superjacent integuments are usually thick and red. A dependent opening into the cavity may be easily formed by pulling one of the grinders, or a stump remaining in the place of one of them, as the partition between the bottom of the alveolar hollow and the antrum is so thin as to afford no resistance which a common probe is not able to overcome. In this way, however, little advantage is obtained, as the matter is still not evacuated with sufficient freedom, and it is usually found necessary to establish a more ample aperture by separating the cheek from the gum opposite the bicuspid teeth, and breaking down the anterior wall of the cavity sufficiently to admit the point of a finger, which, owing to

the weakness of the bone at this part, may be executed more easily than might be expected.

Tumors of the Gums and Jaws.

Excrescences of a firm substance, irregular surface, and usually whitish color, are not unfrequently met with proceeding from the gums. If allowed to pursue their own course, they increase in size, loosen the teeth in their neighborhood, and at length may prove fatal by causing hemorrhage, profuse discharge of matter, or excessive and long-continued pain. These growths ought to be freely cut away, and as they extend to the alveolar process, the adjacent teeth must be extracted, so that the excision may be completely effected by cutting-pliers.

Both the upper and lower jaws are liable to morbid degeneration of structure, giving rise to medullary and fibro-cartilaginous tumors. The former occurs more frequently in the upper than the lower, and generally extends to the bones of the nose and orbit; the latter is more common in the lower jaw. The medullary growth, as in other parts of the system, is attended with severe pain, an unhealthy appearance, and, in its more advanced stage, profuse fetid discharge or hemorrhage. The fibro-cartilaginous tumor, though sometimes in the first instance the seat of uneasy sensations, usually produces no inconvenience except by its bulk, to which no limits can be set. At length occasional bleeding takes place from the surface, but this seldom happens until the tumor has existed for years and attained a very large size. There is never any purulent or fetid matter discharged, and the substance of the mass remains as dense and entire as at the commencement of its formation. This kind of growth is usually met with in young persons between puberty and middle age.

The only method of relieving the patient from these tumors, whether of the one kind or the other, is complete excision. This used to be attempted by cutting out with saws, forceps, and chisels, the diseased mass alone, the adjacent part of the jaw being allowed to remain. Such operations, with hardly any exception, proved ineffectual in accomplishing a radical cure, as the smallest portion of bone possessing the morbid disposition, that was not eradicated, insured a return of the disease. The great improve-

ment has been introduced into modern surgery of amputating the jaws when they become the seat of these formations, in a part of their extent which is perfectly free from enlargement, or any other indication of unhealthy action. The names of Gräfe of Berlin, Dupuytren of Paris, Mott of New York, Crampton and Cusack of Dublin, and Gensoul of Lyons, are most deserving of mention for adopting and establishing this operation. It has been performed with almost uniform success in cases of the fibro-cartilaginous tumor both of the upper and the lower jaw, and also on account of the medullary growth. From the nature of the bones entering into the formation of the upper jaw, complete eradication is practicable only when the disease is confined to the superior maxillary bone. Growths from the forehead and bones of the nose must be carefully distinguished from those that possess this limited origin, as no satisfactory result would attend their removal.

In performing excision of the superior maxillary bone, an incision should be made through the cheek, extending either from the junction of the maxillary and malar bones to the angle of the mouth, or from the inner angle of the eye directly down through the lip. The integument having been dissected from the tumor, and the margin of the orbit exposed, one blade of a large pair of cutting-pliers is introduced into the nose, and the other into the orbit, so as to divide the nasal process of the maxillary bone. The connection with the malar bone is next separated in the same way, and then the palate is divided, previously to which one of the incisor teeth must be extracted if necessary. The surgeon having now deprived the bone of all its principal attachments, wrenches it out. There is seldom much bleeding, and no advantage is obtained by tying the carotid previously. The only vessels that require to be tied are the facial and posterior palatine arteries, and the latter not always. The cavity of the cheek should be moderately filled with pieces of lint, and then the edges of the wound are brought carefully together by means of the silver sutures. The deformity which remains after the cure has been completed is very inconsiderable, and the patient is able to speak, eat, and swallow, with much less imperfection than might be expected. In the event of the cure proving permanent, an artificial substitute for the palate may be adapted to the cavity.

Excision of the lower jaw is an easier and less formidable op-

eration. The mode of performing it must be varied according to the size and situation of the tumor. It is usually either confined to one side of the bone, or engages one side more than the other. The base is the part most frequently affected, but the ramus is sometimes implicated, so as to require disarticulation. The best direction for the incision through the cheek is along the base as far as the tumor extends, and, if necessary, up along the posterior margin of the ramus to the condyle. The integument having been separated from the tumor, the jaw is partially cut through with a small saw, and completely divided by strong cutting-pliers. The surgeon then grasping the detached portion turns it outward, and separates its connections with the muscles and mucous membrane of the mouth. If the symphysis is included, means must be employed to prevent suffocation from the tongue being drawn back by the muscles of deglutition, owing to the power which kept it forward having ceased to act. As it is only for a minute or two that there is any risk of this occurrence, the best mode of proceeding is to seize the tongue with a hook, and confide it to an assistant until the tendency to retraction ceases. The only arteries that require to be tied are the facial, and the transverse branches of the temporal, in the case of cutting over the ramus. The cavity of the wound should be gently filled with pieces of lint, after which sutures are to be introduced so as to retain the cut edges in accurate contact. If it is necessary to remove the bone at its articulation, the operation should be conducted as has been described, until the jaw is divided on that side of the tumor where it remains sound. The tumor is then pulled outward, while its connections with the mouth are detached, and at the same time depressed so as to bring the coronoid process within reach. The attachment of the temporal muscle having been divided, the bone is more fully depressed, so as to expose the articulation, into which the knife is carried close round the condyle, in order to avoid the internal maxillary artery, which crosses the neck of this process on its inner surface about half an inch below the joint. The remaining connections are lastly divided, and the operation concluded as has been directed.

The small amount of deformity or inconvenience of any kind occasioned by the excision of the greater part of the lower jaw, can be conceived only from actual observation, and, as well on

this account as the relief afforded to the patient from an oppressive and ultimately fatal disease, the operation may be regarded as one of the greatest improvements in the practice of modern surgery.

CHAPTER XXIV.

NOSE.

Extraction of Foreign Bodies from the Nose.

Children frequently introduce small bodies, such as peas or cherry stones, into the nostrils, where they are sometimes detained in consequence of the enlargement which they suffer, the swelling that takes place in the parietes of the cavity, or simply from their being pushed in with greater force than can be applied from within for their expulsion. The immediate inconvenience is seldom considerable, and the presence of the foreign body often escapes observation for a long while. Sooner or later a purulent discharge and ulceration are induced, and it may happen that surgical assistance is required on account of these symptoms months after the body has been introduced, and when its existence is not known, either from having never been discovered, or from having been completely forgotten. In all cases, therefore, of matter being discharged from one nostril of a child, the surgeon should search the cavity to ascertain if it contains any foreign substance. This is most effectually done by means of forceps with narrow blades terminating in small projecting points. They should be introduced with the branches fully expanded, and held in a vertical direction, parallel with the septum of the nose. From the flattened shape of the nostril they may thus be passed behind any body, however firmly impacted in it, and, after being fairly introduced, they should be closed so as to seize anything that may be present. One or two trials conducted in this way will enable the surgeon to satisfy himself whether or no there is a foreign body lodged in the cavity, and to extract it if detected. When the extraneous sub-

stance has been recently introduced, the process of removal should be performed in the same manner.

Epistaxis, or Bleeding from the Nose.

Hemorrhage from the nose frequently takes place, either commencing spontaneously, or being induced by the injury attending operations in which the parietes of the cavity are concerned. Spontaneous bleeding is generally suppressed by applying cold to the forehead, or introducing a piece of lint, moistened with spirits or some astringent saline solution, into the nostrils. The same means usually prove sufficient when mechanical violence has been the exciting cause. But, in both cases, it occasionally happens that more efficient measures are required; the blood, though prevented from flowing through the anterior openings of the nose, being observed to trickle down into the throat. It is then necessary to close the posterior nares also, by introducing a piece of lint. This may be done in various ways, and instruments have been contrived for the purpose; but the most convenient method is to pass a probe, curved to the form of the palate, through the nose into the pharynx, and then draw it out of the mouth, conveying by its means a piece of strong ligature, about a foot and a half in length. A compress of lint, large enough to obstruct the posterior opening of the nostril, is next tied securely to the middle of the thread which issues from the mouth. The other end being pulled, this plug is drawn backward, and, with the assistance of the operator's left fore-finger, is lodged behind the soft palate, at the nasal orifice. The two ends of the thread are then secured; and when it is judged safe to remove the plug, the thread that lies in the mouth affords the ready means of doing so.

Polypus of the Nose.

Tumors of several different kinds are met with in the nasal cavities; and though comprehended under the general denomination of polypus, must be carefully discriminated in regard to their prognosis and treatment. The most common of these growths possess a soft, but rather tough consistence, and yellowish-gray color; they bleed slightly when injured, and have not much sensi-

bility; they often contain collections of limpid fluid, so as to constitute thin bags. These are named Simple, Mucous, or Benign Polypi. They grow from the mucous membrane generally, where it covers the upper part of the nostrils, sometimes where it lies upon the inferior spongy bone, but never from the septum. They seldom exist singly, and are often met with in numbers together. One nostril is very rarely affected alone. They occur at all periods of life, but are most frequent about middle age. They enlarge until the cavity is filled, and then remain stationary, without causing any expansion of the face by the pressure proceeding from their continued increase. The symptoms which they occasion are obstruction of respiration, an uneasy sensation of stuffing of the head, dullness or total loss of smell and taste, and sometimes deafness. It is generally observed that these symptoms are most distinct in moist weather, and least so in an opposite state of the atmosphere.

The treatment of mucous polypus consists in removing them; and though various methods have been employed for this purpose, there can be no doubt that the best mode of effecting it is evulsion by forceps. The instrument must be so small that its blades can be passed up along the sides of the polypus to its root, where they should be fixed by strong compression of the handles. The surgeon then, by a compound movement of pulling and twisting, the latter of which should be steadily in one direction, endeavors to disengage the connections of the tumor. He may fail in the first or several subsequent attempts, but by careful and persevering efforts, guided by acquaintance with the shape of the cavity, he is sure of ultimately eradicating the disease. Except in those rare cases where the polypus is single, the patient can hardly be completely relieved by one operation; and the nostrils, though seemingly quite cleared, are again and again found more or less occupied by a similar excrescence. The cause of this is probably not so much reproduction as expansion of the polypous growth, and the repeated relapses, therefore, ought not to occasion discouragement. Astringent washes and caustic are sometimes employed to repress the tendency to new formation, but there is reason to believe that the good effects obtained in this way are very inconsiderable, and it would be improper to confide in them so far as to withhold the use of the forceps so long as any vestige of the dis-

ease can be discovered to exist. It is necessary to beware of mistaking for this disease a mere thickening of the mucous membrane over the inferior spongy bone, which is common in children, or a projection of the septum to one side, which exists to a slight degree in most people, and not unfrequently encroaches so much on the nostril as to occasion serious inconvenience.

The next kind of polypous growth from the nasal cavities that may be mentioned is of variable consistence, from the softness of brain to the firmness of glandular tissue, but is always extremely friable in its structure, so as to tear easily, and when subjected to extension, gives way at the part where the force is applied. It bleeds profusely when injured—tends to increase without any limitation, making room for its accommodation by expanding and separating the bones of the face—and is found to originate from the osseous substance of the parietes of the cavity. This medullary, bleeding, or malignant polypus, as it is named, usually occurs at the middle and later periods of life. It is distinguished by the characters which have been mentioned, and by being attended with pain, and bloody or purulent fetid discharge. The rapidity of its progress is very variable, but its result is always unfavorable.

The radical removal of this disease is impracticable, and when the morbid disposition is very active, or when the disposition to bleed is great, any attempts to delay its progress by extracting as much of the mass as can be reached are hardly prudent, being more likely to accelerate than prolong the patient's fate. In cases of a milder description, advantage may be derived from clearing the nostrils occasionally, which is easily accomplished, and relieves the patient from time to time. The operation cannot be performed well with forceps alone, as the want of cohesion in the morbid structure prevents them from removing any more of the mass than what is actually embraced between their blades. Knives, scissors, and hooks are employed, but the best instrument for the purpose is a finger, which, being introduced into the expanded nostrils, feels where the polypus is attached and forces it away from the bone. The cavity, having been thus emptied, is stuffed with lint to stop the bleeding.

The third and last kind of polypus that requires to be noticed is remarkably distinguished by the extreme firmness of its texture,

which nearly equals tendon in strength. It is distinctly fibrous, and has hence been named the Fibrous Polypus. It bleeds profusely when injured, increases without any limit, descending into the pharynx, and proceeding beyond the external orifice of the nose, and ultimately proves fatal by causing hemorrhage, suffocation, or pressure on the brain. It almost always exists singly, and occurs chiefly in young adults of the male sex. M. Dupuytren, who first remarked the peculiarities of this fibrous structure, supposes that it frequently exists as an antecedent of the medullary or brain-like polypus, into which it degenerates, first at the part most distant from its root, and ultimately throughout its whole extent. It may be stated, however, on the evidence of extensive observation, that the soft kind of growth often (so far as I have seen, always) displays its proper characters from the commencement; and there are cases on record in which the fibrous polypus retained its distinctive firmness of texture after existing for years and attaining a great size. It seems to adhere to the bone, but not to depend on any diseased condition of that tissue, so that if torn out by the root it may be permanently removed. This method has been recommended by Dupuytren as the only mode of effectual treatment. Sometimes it distends the *antrum maxillare*,—and, having caused absorption of the walls of the cavity, protrudes under the cheeks, where it may be exposed by dividing the mucous membrane of the mouth, and seized with forceps. The instruments for this purpose should be very strong, and provided with numerous large projecting teeth. Several pairs in general are required to be fixed in succession as space is gained,—and the strength of two or more stout assistants has been found necessary to effect the evulsion. In performing such operations, the surgeon should be prepared for a profuse hemorrhage,—and, as a precautionary measure, ought to pass a thread for plugging the posterior opening of the nostril, if this should prove necessary.

Polypous growths of different kinds sometimes, instead of growing forward into the nose, descend into the pharynx. In such cases the best plan is to detach the polypus by seizing its roots with forceps introduced through the nostril, and then draw it from the nose or push it into the throat.

Ulcers and other Diseases of the Alæ of the Nose.

It has already been observed that warty excrescences on the face are apt to degenerate into malignant sores in the advanced period of life. When cancers, originating from this or other sources, are seated over the cartilages of the nose, it is prudent to cut away a portion of the whole thickness of the parietes, as the disease can hardly be extirpated otherwise, and ineffectual attempts would probably promote the diseased process. If this operation is performed early, the cut edges may be brought together and united so as to leave no perceptible deformity.

The skin of the nose is liable to an overgrowth, which at first makes it present a warty or tuberculated appearance, but when more advanced, completely alters its shape, and constitutes large, irregular, pendulous masses, which occasion great deformity and inconvenience. In cases of this kind that are so aggravated as to warrant an operation, the redundant substance may be shaved off, while the surgeon, by keeping his finger in the nostril, ascertains the extent to which he should cut. Cold applications restrain the bleeding; and when cicatrization is completed, wonderfully little trace of the disease remains. It may afterward return and require similar treatment, but the operation is seldom necessary more than once.

Lupus, or *noli me tangere*, is an obstinate ulceration of the nose or adjacent parts, always superficial in the first instance, and generally continuing so, but sometimes extending more deeply and causing extensive destruction of the face. It presents various appearances, but in general has the character of healing at one part while it extends at another. The ulcer is usually covered with a scab, and surrounded with inflamed skin. The disease, though left to itself, sooner or later suffers a spontaneous cure, but seldom until great deformity is occasioned by its ravages. It occurs chiefly in youth, and affects females more frequently than males.

The treatment of this affection is very unsatisfactory, since the mode employed often proves unavailing, or procures merely a temporary amendment. The general health, if deranged, ought to be restored if possible by an appropriate course of alterative

medicine and diet; but it is on local applications that the principal reliance is usually placed. Of these, different preparations of arsenic are regarded as the most efficient; but I have found most advantage from the use of caustic potass.

Restoration of the Nose.

The nose may be defective as a fault of original formation, or from the effects of violence, or in consequence of ulceration. The want of this feature not only causes a most disagreeable deformity, but impairs the sense of smell, and exposes the patient to annoyance from the entrance of foreign matters into the nostrils. Ingenious practitioners have endeavored to construct a substitute for the lost part, by attaching in its place a flap of skin taken from some other part of the body. There are two methods that have been chiefly followed in doing this, which are named the Italian and Indian. The former was contrived and practiced by Taliacotius. It consisted in dissecting from the arm a flap of skin, uniting one of its edges to the face while the other remained attached to the arm, and after the union was completed, separating the piece of skin entirely from the arm, fashioning it properly for representing the nose, and completing its union with the face. This operation seems to have been repeatedly performed by Taliacotius and some of his contemporaries, but has not been adopted in modern surgery. The Indian method is simpler, and better calculated to attain the object in view. It is executed by dissecting from the forehead a flap of skin sufficient for constructing the absent feature. The size and shape requisite for this purpose having been determined by fitting a piece of card or wax into its place, and then expanding this upon the forehead, where its extent is defined by marking the skin round it with ink, the flap is detached, with the exception of a narrow slip at its lower part, which is left to supply it with nourishment, and its edges are connected by stitches to raw surfaces formed where they are required on the face. Tubes are inserted into the nostrils to permit respiration, and a sufficient quantity of lint is introduced to give them the requisite shape. Cloths wet with cold water are then applied to moderate the subsequent action and promote union by the first intention. This operation, which seems

to be of very ancient origin, was first adopted in this country by Mr. Carpue. It has since been frequently practiced both at home and abroad, and often with results highly creditable to the dexterity of the operators. But though noses may thus be formed which would not attract attention at a distance, and appear tolerably well in a drawing, where the disparity of color, surface, and other characters are not expressed, it must be admitted that the substitute is almost always even more disagreeable than the deficiency; and there is good reason for regarding such achievements as more curious than useful, especially as, by means of enamel or other suitable compositions, imitations of the lost part may be constructed, which prove more seemly and much less uncomfortable to the patient.

CHAPTER XXV.

THE EAR.

Foreign Bodies in the Ear.

CHILDREN are very apt to introduce peas and other small bodies into the ear, and attempts to remove them with forceps of the usual construction tend to press them inward. The forceps, or a slightly-curved steel probe, is the most convenient instrument for the purpose. It has happened that the extraneous substance, by swelling after its introduction, or by being very forcibly inserted, resisted the most careful efforts at removal in this way, and it has become necessary to make an incision into the tube of the ear at its posterior side, so as to permit the introduction of a hook or probe for effecting the dislodgment. Such a proceeding can very rarely be necessary, and the surgeon should beware of having recourse to it in cases where he cannot detect the foreign body by external examination, and is led to believe in its presence merely by the relation of the patient's friends, as an erroneous impression of this kind is frequently produced by disagreeable

feelings in the ear, remaining after the removal of some irritating substance.

The ceruminous secretion of the ear frequently accumulates in undue quantity, and occasions deafness more or less complete. When this is discovered by inspection of the cavity in a bright light, a little oil should be introduced to soften the mass, after which repeated injections of warm water are to be thrown in to wash out the wax. The patient should afterward avoid exposure to cold, and take measures to prevent the same thing from happening again.

A preternaturally dry state of the meatus and membrane of the tympanum, depending upon a deficient secretion of wax, also impairs the sense of hearing, and benefit in such circumstances is often derived from anointing the surface with some stimulating ointment, as a mixture of axunge with a small proportion of oil of cloves, or any other of a similar kind.

Inflammation and Suppuration of the Ear.

Inflammation of the ear is generally induced by exposure to cold. It is attended with pain, more or less acute, and either confined to the ear, or extending through the head. Pressure or motion of the auricle increases the patient's distress, and there is constitutional disturbance in proportion to the severity of the local complaint. The attack terminates in resolution or suppuration, the matter in the latter case being effused, either exteriorly to the membrane of the tympanum, or within it, so as to cause pressure and absorption, for obtaining vent to escape. In the former case there is merely a running, which admits of cure without loss of hearing; but in the latter, there is apt to be caries of the temporal bone, and a permanent discharge, with partial or complete deafness.

The treatment of the inflammatory state requires bleeding, cathartics, warm fomentations, and the antiphlogistic regimen. The chronic discharge of matter demands the injection of metallic washes, and blistering on the back of the neck. And when the bones are affected, the same means may be employed, but with an unfavorable prognosis. Recovery from this state sometimes occurs; but more frequently the disease proves obstinate, and oc-

casionally fatal, by leading to a morbid condition of the brain, particularly the formation of abscesses in its substance.

Polypus of the Ear.

Polypous excrescences are occasionally met with growing from the cavity of the ear, and protruding either through the external aperture, or an opening caused by absorption in the posterior wall of the canal. They usually possess a florid color and vascular structure. They are attended with a thin muco-purulent discharge, and seem to agree in their nature with the growths which spring from the lining membrane of the prepuce and the conjunctiva, in consequence of inflammation terminating in suppuration. The best mode of treating them is to pull away with forceps as much as possible of their substance, and then touch the remaining surface with nitrate of silver, afterward using injections of sulphate of zinc, or other metallic solutions, to correct the morbid action of the membranes.

Obstruction of the Eustachian Tube, and Perforation of the Membrane of the Tympanum.

The Eustachian tube is liable to be obstructed at its pharyngeal extremity by a variety of circumstances, of which the most deserving of notice are, thickening and adhesion of its lining membrane consequent on inflammation of the throat, enlargement of the tonsils, and nasal polypus. It has been already mentioned, in regard to the two last of these affections, that they occasionally give rise to deafness in this way, which is relieved by their removal. But when the tube is closed, the only method of restoring the patient's hearing is to remove the obstruction, by introducing probes or injections through the nose into the contracted or obliterated tube. This operation is so extremely difficult and uncertain, that it cannot be regarded as affording any real advantage; and it has therefore been proposed, in such cases, to make an opening in the membrane of the tympanum, so as to place it in equilibrium as to the pressure of the atmosphere on its internal as well as external surface. Numerous attempts have been made with this view, and frequently with temporary benefit. The re-

turn of deafness, which the patient has almost always suffered, has been ascribed to closure of the aperture, and various modes of making it have been proposed, in order to prevent the edges of the wound from uniting. It is probable, however, that the relapse depends on other circumstances, as it is not easy to conceive how the edges of such wounds could unite, except as a rare accident, and since the deafness has returned, even after a part of the membrane was actually removed.

APPENDIX.

DISEASES OF THE RECTUM.

PREFACE TO THE FIRST EDITION.

The Diseases of the Rectum are very frequent in their occurrence, and derive additional interest, from the distressing symptoms which they occasion, as well as the relief of which they admit from the resources of surgical art. It may be added, that the mystery and concealment connected with their situation not only favor the deceptions of empirical practitioners, but also encourage the proceedings of wrong-headed operators, who prefer the most painful and dangerous means of treatment to those which are easy and safe.

On these accounts it is desirable that this department of surgery should be thoroughly understood by the members of the profession, and that its leading principles should be placed prominently before them. The Diseases of the Rectum have accordingly been made the subject of many treatises expressly devoted to their consideration, and it may seem unnecessary for me to increase the number of these productions. But the progress of modern pathology and surgical practice has introduced many improvements that have not yet been fairly brought together, and explained in their application to the management of those complaints which are at present more particularly in view. I have attempted to supply this defect; and, by a plain statement of the seat, nature, symptoms, and treatment of the different affections which are met with at the extremity of the rectum, endeavored to assist practitioners in discharging their duty to the patient, and to protect patients against unprincipled or reckless practitioners.

It was not my wish to criticise the writers who have preceded me; and I have not done so except on one or two occasions, where it seemed necessary in order to explain my own meaning. From unwillingness to extend the limits of the treatise, I have not related detailed cases; but I may assure the reader that there is nothing stated which does not rest upon my own observation.

9 Charlotte Square, *November*, 1837.

PREFACE TO THE SECOND EDITION.

In preparing a new edition of this Treatise, I have carefully reconsidered every statement which it contains, and compared the opinions formerly expressed with those which the additional experience of nine years' practice has led me to entertain. The result of this inquiry has been little substantial alteration, but some change of arrangement and expression, which I hope

may render the meaning more distinct and intelligible. From circumstances frequently coming to my knowledge, it would appear that diseases of the rectum are still not treated universally on sound and rational principles. Many old-established practices and obstinate prejudices continue to obstruct the progress of improvement; and even a learned Reviewer has thought proper to declare his impenetrability to conviction in the following terms:*

"Mr. Syme states 'that, however long the fistula may be permitted to continue, no more than one internal opening is formed.' Now, with the strongest moral conviction that this opinion is incorrect, our practice has never afforded us an opportunity of verifying, by an examination after death, the impression which existed on our mind." It thus appears that a prejudice, or what this gentleman chooses to call a "moral conviction," may resist the admission of truth, even when it is stated as matter of fact ascertained by observation. It would therefore be unreasonable to expect anything more than a gradual emancipation from the errors which have so long rendered diseases of the rectum an opprobrium to surgery and a fruitful field to empiricism. I have reason to believe that this little work has been of some service in promoting the accomplishment of an end so desirable—and if it shall continue to be so, the object of its production will be fully attained.

9 Charlotte Square, *August*, 1846.

PREFACE TO THE THIRD EDITION.

The first edition of this book was written sixteen years ago, in order to rescue diseases of the rectum from the hands of the rapacious specialist, by establishing their treatment on sound principles of surgical practice—by pointing out the best modes of procedure already known—and by suggesting other means of remedy for those derangements that seemed to require them. More particularly I endeavored to correct the improper method of operating for Fistula in Ano, then practiced and inculcated throughout Great Britain, by drawing attention to the observation of M. Ribes respecting the position of the internal orifice—the necessity of including it in the incision—and the inexpediency of cutting beyond this point. I also combated the error which referred the origin of Fistula to ulceration of the mucous lining of the bowel; and endeavored to show that when the operation was performed upon correct principles, instead of being, as formerly, painful, bloody, and uncertain, requiring a protracted course of dressing, and subjecting the patient to prolonged confinement, it caused hardly any pain or bleeding—required no subsequent dressing, or confinement beyond a few days—and rarely if ever failed in proving effectual. In regard to Internal Hemorrhoids, I explained how

* British and Foreign Medical Review, vol. v. p. 481.

the ligature could be employed with safety and efficiency, so as beyond all question of expediency to supersede the dangerous and uncertain methods of treatment by caustics, acids, red-hot irons, and the knife. I also called attention to the injurious effects of a secondary kind, produced by a continued discharge of blood from this source—protested against the mischievous fallacy of representing such a drain as salutary—and showed that the most alarming symptoms simulating cerebral or cardiac disease could be safely remedied by its suppression. The frequent and distressing infirmity of "Prolapsus" was shown to depend almost always on hemorrhoidal disease,—and, therefore, to be easily and effectually remediable, instead of, as generally supposed, only admitting the imperfect palliation afforded by mechanical support. Polypus of the Rectum was discriminated into its three different conditions of Fibrous—Vascular—and Malignant, to each of which the appropriate treatment was assigned. Strictures of the Rectum, whether simple or malignant, were shown to be limited, with hardly any exception, to the distance of little more than two inches from the orifice, so that the proceedings of specialists, who still continue to thrust bougies far up the gut, must proceed from ignorance, or motives even less creditable. The Spasmodic Stricture was described, and explained to admit of no relief except by division of the external or subcutaneous sphincter,—and that most intolerable of ailments, Fissure of the Anus, instead of requiring complete division of the whole sphincter, with consequent dressing and confinement proportioned to the severity of this operation, was shown to be remediable easily and certainly by an incision hardly extending beyond the mucous membrane.

In the present edition I have little to add or alter, and, therefore, as the numerous treatises that have appeared since the first one was published, to say nothing of the compendiums which have of late years so industriously gathered together all that is good, bad, and indifferent of surgical principles,—probably contain most of the practical information it was originally my object to convey, it may be thought unnecessary for me to publish any further on the subject. But as my booksellers inform me that the last edition is entirely exhausted, and as some readers may prefer obtaining information from its original source to picking it up at second hand, I beg to offer this third edition, in the hope that it will meet with a no less indulgent reception than its predecessors have experienced.

DISEASES OF THE RECTUM.

CHAPTER I.

FISTULA IN ANO.

It does not at first sight seem easy to understand how the disease named *Fistula in Ano* has become so well known to the public, and why the slight incision required for its remedy is still thought worthy of being performed in the theater of a hospital. The mere frequency of the complaint, and the unpleasant nature of its symptoms, do not afford a satisfactory explanation of this; while its hidden seat, and the disagreeable feelings connected with it, so far from favoring exposure, must tend to conceal the knowledge of its existence, as well as the means employed for its treatment. In these circumstances, the interest taken in fistula, both by the profession and by the public, can be ascribed only to the well ascertained fact that the disease does not admit of remedy except from an operation, which was formerly one of great severity and even considerable danger.

Louis XIV. suffered from *fistula in ano*, and, being unwilling to undergo the operation which his medical attendants assured him was necessary, listened to various proposals for curing the disease without having recourse to the knife. Instead of trying these methods on his own person, however, he collected a number of his subjects who labored under the same infirmity, and caused the proposed experiments to be tried upon them. Some of them he dispatched to the waters of Barèges, others to those of Bourbon, and many more he shut up in rooms provided with everything that could be suggested in the way of treatment for the purpose in view. At the end of a year, finding that not a single patient had been cured, his Majesty yielded to necessity, and permitted his surgeon, M. Félix, to perform the incisions which he judged proper.

We have here a striking illustration of the necessity of the opera-

tion; and the importance attributed to its performance, as formerly practiced, may be estimated from the number of medical men who were present on this occasion, together with the amount of their remuneration. Besides the surgeon and assistant-surgeon, there were two physicians, four apothecaries, and an apprentice, and the sum total of their fees amounted to £14,700.*

The inefficacy of all remedial measures for curing fistula except the knife still remains unquestioned, unless by inaccurate observers or unprincipled empirics;† but the extent to which it must be employed is now happily ascertained to be greatly less than was formerly supposed, and, through progressive improvement, it has been at length circumscribed within such narrow limits as hardly to deserve the serious title of an operation. In order to trace the steps which led to this important result, and to understand the true principles of treatment which have been finally established, we must consider the origin of fistula, the causes that give rise to it, the symptoms attending it, and the circumstances which impede its spontaneous cure.

ORIGIN OF FISTULA IN ANO.

In the first place, a collection of matter is formed under the integuments of the hip near the anus, and usually to one side of it. This deposit sometimes occurs quickly, with heat, redness, and pain of the part, at other times slowly and insidiously, without any sign of inflammatory action, so that the first circumstance which attracts attention is a flat and ill-defined swelling that results from the presence of the fluid, together with thickening of the adjacent cellular substance. In whichever of these ways the abscess is formed,—and every variety is met with, from the rapidity of a few hours to the slowness of as many months,—the matter, if permitted to remain, sooner or later, by inducing absorption of the neighboring textures, makes a way for itself to the surface. As it is situated between the skin of the hip and the

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* M. Félix, 50,000 Crowns = £6000.
Dr. Daquin, 100,000 Livres = £4000.
Dr. Fagon, 24,000 do. = £1000.
M. Bessière, 40,000 do. = £1500.
Four Apothecaries (each 12,000 do. = £500) £2000.
M. Raye (apprentice to M. Félix), 400 Pistoles = £200.
Dionis, Course of Surgical Operations, p. 228.

† Some of the latter, who advertise their ability to cure fistula without cutting, accomplish the object through employing ligatures of silver or lead wire, by a tedious and irksome process.

mucous coat of the rectum, evacuation may be effected through either the one or the other of these coverings. But in conformity with the general law of progressive absorption occasioned by the pressure of matters foreign to the healthy constitution of the body, the contents of the abscess by far most frequently escape by an aperture through the external integument. This opening is usually very small, often hardly perceptible; and if the cavity be examined after its contents have been discharged, the mucous membrane will be found completely denuded, to more or less extent, at the distance of an inch or a little farther from the anus. As the matter, in order to get into this situation, would, if originally deposited externally to the sphincter, have to penetrate between the muscular fibers, its formation probably takes place in connection with the inner coat of the bowel, whence it proceeds outward, overcoming the obstacles opposed to its progress in this direction, instead of pursuing an inward course, in opposition to the general tendency which leads to the external surface of the body.

If the patient has been previously in pain he feels comparatively well after the matter is evacuated, and may suppose that he is to recover without any further trouble. But the cavity of the abscess, though it contracts, does not become obliterated; the discharge continues of a thin and watery consistence; and the orifice acquires a still greater degree of straitness, at the same time generally projecting from the surface of the skin in the form of a small pimple-like protuberance, at the summit of which it is situated. This appearance is owing to an effusion of organizable matter round the opening, in consequence of the continued irritation which is caused by the discharge passing through it. From the same cause the sides of the sinus acquire an increase of thickness and density, so as to assume the condition which in surgical language is designated fistulous. If the disease be still permitted to pursue its course unchecked, a small aperture is sooner or later formed also through the thin denuded part of the mucous membrane of the rectum. It may seem surprising that this second opening should be formed after the matter has procured vent elsewhere; but there can be no doubt as to the fact, and it agrees completely with what is observed to happen in the case of abscesses situated in the neighborhood of the urethra, which, after their evacuation, whether spontaneous or artificial, often discharge purulent matter alone for a time, and then urine also. The true explanation in both cases probably is, that the matter, from not escaping with perfect freedom, accumulates in the cavity, so as to cause sufficient pressure for inducing ulceration of the denuded membrane. It is very seldom

that a fistula of more than two months' standing will be found not to have an internal aperture.

It happens sometimes, but very rarely, that an aperture is formed in the first instance through the mucous lining of the gut. This constitutes what has been called a Blind Internal Fistula; the other two conditions already mentioned being named the Blind External, and the Complete Fistula. The history of the case, especially the existence of pain and tension in the vicinity of the anus subsiding after a discharge of matter from the bowel, the continuance of such a discharge, and the presence of a flat induration in the hip, with softness and depression in its center, are the signs which lead to the detection of this form of the complaint. However long the fistula may be permitted to continue, no more than one internal opening is formed; but through the occurrence of successive abscesses, the external apertures are occasionally multiplied, and sinuses may extend into the hip as well as the perineum.

Having stated so positively that *fistula in ano* originates in the texture adjacent to the mucous membrane, by the formation of an abscess, which remains entire until after the evacuation of the matter, I cannot avoid noticing the very different statement upon this subject, which has been lately published by Sir B. Brodie.*

"I believe that this is the way in which fistulæ in ano are always formed, namely, the disease is originally an ulcer of the mucous membrane of the bowel, extending through the muscular tunic into the cellular membrane external to the intestine; and I will state my reasons for entertaining that opinion. The matter is one of great interest as a question of pathology, but it is one of great importance, as I shall show by-and-by, in connection with surgical practice. It is admitted by every one that in the greater number of cases of fistulæ in ano there is an inner opening to the gut as well as the outer opening; and I am satisfied that the inner opening always exists, because I scarcely ever fail to find it now that I look for it in the proper place and seek it carefully. I have, in a dead body, examined the parts where fistulæ had existed several times, and in every instance I have found an inner opening to it. This affords a very reasonable explanation of the formation of these abscesses; it is almost impossible to understand, on any other ground, why suppuration should take place in the vicinity of the rectum more than in any other part of the body, and why the cellular membrane there should suppurate more than cellular membrane elsewhere. Moreover, the pus contained in an abscess near the rectum

* Lancet, 26th January, 1844, p. 530.

scarcely ever presents the appearance of laudable pus,—it is always dirty colored and offensive to the smell,—sometimes highly offensive, and occasionally you find feculent matter in it quite distinct. There is no reason why an abscess simply formed in the cellular membrane should smell of sulphuretted hydrogen; but there is a good reason why it should do so if it be connected with the rectum."

Without inquiring into the theoretical grounds upon which this explanation is founded, I would remark that the point in question is a matter of fact, which readily admits of being ascertained by actual examination. Having made this examination times innumerable, before as well as after evacuation of the abscess, I do not hesitate to affirm that, when a *fistula in ano* is formed, *the mucous membrane always remains entire in the first instance, and is never perforated until after suppuration has taken place.* That the rectum may be injured, as by fish-bones or other hard substances arrested in it, or by the improper use of an injecting apparatus, and that its contents, thus permitted to escape into the cellular substance, give rise to large collections of putrid matter, it is not my intention to deny. But such events should plainly be considered quite distinct from the spontaneous formation of abscesses giving rise to fistula.

CAUSES OF FISTULA IN ANO.

The process which has been described as leading to the formation of *fistula in ano* occurs in both sexes, and at every time of life, but is out of all proportion more frequent in males than females, and is comparatively rare before twenty or after sixty years of age. I have operated repeatedly on children for this disease, and more than once on infants only a few months old; but very seldom beyond the age of seventy.

The circumstances which occasion the disease act either by exciting a predisposing liability to it, or by directly calling it into existence. Of the former may be particularly mentioned chronic derangement of the lungs and digestive organs, especially the lower part of the intestinal canal. And of the latter the most important are constipation of the bowels, sedentary occupations, and exposure to cold. It is difficult to trace the connection between pulmonary complaints and *fistula in ano;* but no point in pathology is better established than that there is such a connection; and attention is not unfrequently first drawn to the phthisical condition of a patient by the disposition that he shows to suffer from the disease in question; whence it has sometimes been erroneously supposed that the discharge of the fistula brings

on the disease of the lungs. As the great intestine is generally found ulcerated in the bodies of those who have died from consumption, it seems probable that the morbid state of this part, and not that of the lungs, is the exciting cause of fistula, but the disease certainly does occur in cases of pectoral affection which exhibit no symptom of intestinal disorder. Most frequently the cause of the disease cannot be precisely ascertained, and the patient is often not aware of its presence until he happens to notice the discharge of matter which proceeds from it. Among the causes of fistula are sometimes reckoned diseases of the bones of the neighborhood, as caries of the sacrum, or exfoliation of the denser osseous texture which composes the ischium. But the fistulous canals in the vicinity of the anus originating from these sources, are not properly classed with a disease which exists independently of any other local cause than its own peculiarity of constitution. They cannot be remedied by the same means as *fistula in ano*, and, when remediable at all, require different treatment.

SYMPTOMS OF FISTULA IN ANO.

Uneasiness about the anus, with a more or less copious discharge of thin purulent matter, staining the linen, and otherwise annoying the patient, are the most constant symptoms of the complaint. The occasional escape of flatus and mucous fluid from the rectum, are generally superadded in the case of a complete fistula. But the passage of feculent matters through the preternatural channel, though often mentioned as a part of the inconvenience experienced, does not usually take place, and indeed is never met with, except when the disposition to the disease is very strong, as chiefly happens in confirmed phthisis, in which case the aperture of the fistula, externally as well as internally, instead of being small and circumscribed by effusion of organizable lymph, is large and flabby. Besides the exudation from the fistula, and more or less uneasiness about the part, especially in going to stool, people of much sensibility are further distressed by a feeling of weakness and imperfection, which renders their existence almost intolerable. Sympathetic pains, referred to the thigh, leg, or foot, are also sometimes experienced, and have not unfrequently been mistaken for sciatica. There are other persons of a less sensitive constitution, who suffer comparatively little from the disease, and are able for a long while to endure the discomfort which it occasions. As an instance of this, I may mention the case of a gentleman between fifty and sixty, on whom I operated for a complete fistula with two external openings, which had existed for thirty-five years. As has been already

observed, the orifice of the sinus is usually very small, and, though generally rendered more manifest by being elevated above the surrounding surface, it still not unfrequently escapes the notice of the patient, especially as it is apt to close occasionally for a time. Even the surgeon sometimes experiences difficulty in detecting the disease from this source of obscurity; and I have repeatedly operated for a complete fistula, after the patient had been assured that there was no morbid affection whatever in the neighborhood of the rectum. The fluid which is discharged varies both in quantity and quality, being at one time thin and watery, at another thick and purulent. It is often so scanty and limpid, that obliteration of the cavity seems about to be accomplished. But sooner or later the flow is increased; perhaps a new abscess forms, leaving another orifice; at all events, the fistula remains as obstinate as ever, having no natural limit to its existence.

When the fistula opens into the gut, more or less flatus and mucus must pass through it, owing to the resistance which the sphincter muscle opposes to their exit by the anus, and thus adhesion or contraction in the surface of the sinus will be effectually prevented. But when the fistula is not complete, the reason why it should not heal like a sinus in any other part of the body is less apparent. The mere laxity of the texture, or any other peculiarity in the nature of the part concerned, is not sufficient to account for this, since suppurating cavities in the neighborhood of the rectum are known to heal very kindly and readily, as for instance that which results from the operation of lithotomy. When the sinus penetrates, as it almost always does, between the fibers of the sphincter, the obstinacy in question may be ascribed to the frequent motion and separation of the sides of the cavity, which must result from the action of the muscle. But even this obstacle to recovery is not always present, since the fistula sometimes lies quite superficially under the skin and mucous membrane, without passing through the muscular fibers at all. It therefore seems most probable that the detached and denuded state of the mucous coat of the gut is the cause that prevents a healing action.

TREATMENT OF FISTULA IN ANO.

It appears from the records of surgery, that the treatment of *fistula in ano*, until within the last hundred years, was extremely complicated and severe. The induration surrounding the walls of the sinus being attributed to a peculiar morbid action in the part, seemed to admit of no remedy except by destruction or removal; and the cavity itself was thought to require complete division of the gut throughout the whole

of its extent affected, with subsequent dressings of the most careful kind. In conformity with these principles, we find that after the patient had been prepared by bleeding, purging, and regulated diet, corrosive sublimate or other powerful escharotics were introduced into the fistula, so as to bring away a slough in the form of a cylinder; that pieces of gentian root or sponge tent were next inserted to dilate the cavity, and, by thinning the partition between it and the gut, facilitate the third step of the operation, which consisted in dividing the septum to its farthest extent; and that until the cure was completed, various carefully medicated dressings were daily introduced. Such being the established principles of practice, different practitioners followed out the objects which they kept in view by a variety of methods. Some, instead of the slow and uncertain action of caustic, employed a knife for removing the callosities, either scooping them out at once, or cutting freely through them in several directions, so as to inflict what was deemed sufficient injury to insure their destruction by sloughing or suppuration; some divided the septum between the gut and sinus by means of knives, or scissors, or apparatus specially contrived for the purpose, such as what was called the "probe-razor;" and others thought it better to transfix the gut with a needle, so as to include the partition in a ligature of thread or lead wire.

The treatment thus conducted was not only tedious and painful, but often attended with alarming consequences. Inflammation and constitutional disturbance were apt to follow, and the extensive incisions practiced for the removal of callosities, or dividing the septum of a deeply penetrating sinus, frequently occasioned hemorrhage very formidable, as well from its amount as the difficulty of arresting it. The cure, moreover, was not always complete, a discharge of matter occasionally still continuing, in consequence of the deep wound not healing at the bottom; and we have the testimony of many authors who wrote at the period referred to, that the effect of freely cutting out the diseased parts was frequently so injurious, or rather destructive to the sphincter, as to occasion constipation, and what was equally distressing, though at first sight hardly compatible with it, incontinence of the bowels, their solid contents being retained and the fluid involuntarily expelled. It is no wonder, then, that *fistula in ano* came to be regarded as a complaint meriting the most serious apprehensions of the patient.

In 1765, Mr. Pott published an excellent treatise on the disease, in which he reprobated the practice of destroying the callosities by caustic and cutting them out with the knife, which proceedings he considered equally unnecessary and hurtful. He pointed out that the cavity of

the abscess, and consequently that of the fistula, resulted not from a loss of substance in the part, but merely from distention of the texture, in which suppuration took place, and that the callosities or surrounding induration proceeded not from any new formation, but from induration of the cellular and adipose textures bounding the cavity. On these grounds, he maintained that, in order to effect a cure, it was not necessary either to take anything away, or to use means for promoting the growth of new substance; that all really required was to relieve the parts concerned from the continued irritation, which caused and kept up the callous thickening; and that this object could be attained most certainly by simply dividing the septum, "so as to lay the cavities of the gut and abscess into one," abstaining from all escharotic or irritating applications, and using the mildest dressings. For performing the operation, he recommended a blunt-pointed curved bistoury as the easiest and most manageable instrument.

The soundness of Mr. Pott's principles, the forcible language in which they were expressed, and the authority derived from the public field where he exhibited their practical application, produced a strong impression on his professional brethren, and the treatment of fistula, in this country at least, has ever since been in a great measure free from the objectionable practices formerly in use. As was to be expected, however, many practitioners clung to the methods in which they had been educated; and even in the present day there are some who, whether from imbibing the bad example thus transmitted to them, or from an unhappy peculiarity of judgment, still prefer the old and unjustifiable process of excision. I have seen an eminent professor of surgery in Paris cut out the fistula; and understand that he continues to pursue this practice. Some years ago a middle-aged woman came under my care in the Surgical Hospital, on account of a recto-vaginal fistula, and stated that her complaint commenced with a *fistula in ano*, for which she had had an operation performed by the surgeon of a provincial hospital, who cut something out and laid it on the table, since which there had been a communication between the rectum and vagina. More lately a gentleman from the north of England applied to me on account of some unpleasant consequences resulting from an operation, or rather series of operations, to which he had been subjected, on account of *fistula in ano*. His principal complaint was inability to retain the contents of his rectum, which, notwithstanding the resistance of a carefully constructed bandage, were wont to be suddenly and involuntarily discharged, so as to cause great discomfort, and constant apprehension. Though prepared to find something far wrong, I was not less surprised than shocked, upon inspecting the seat

of the disease, to see no appearance of an anus, but instead of it a deep excavation, at the bottom of which the mucous coat of the bowel presented itself to view completely divested of the sphincter. From these and other facts of the same kind that might be mentioned, I fear it must be concluded that the plan of excision is still not entirely abandoned; but, feeling assured that those who persist in adhering to it, notwithstanding all that has been said and written on the subject, would not have their views altered by any argument in my power to use, I shall leave them to follow the progress of improvement at their own leisure, and shall proceed to explain some important steps that have been established in advance of Mr. Pott's practice.

It had been noticed by Sabatier and other good surgeons, that the internal opening of a complete fistula was generally seated near the orifice of the anus. But in 1820, M. Ribes had the merit of showing* that it was *always* so situated, never exceeding the distance of an inch and a quarter, and often lying considerably nearer the skin. The importance of this observation will appear when it is recollected that, as the operation essentially requires a complete division of the parts intervening between the two openings of the fistula, unless the internal one be sought for in the proper place, it may escape detection, and thus not only occasion an unnecessarily high section of the septum, but from not being included in the incision, lead to a continuance of the disease. When the internal opening is sought for at the summit of the sinus, it cannot be found, so that the fistula is apt to be supposed incomplete or blind external; and M. Ribes, avoiding this error, ascertained that an internal aperture existed much more frequently than had formerly been supposed. I have ascertained further, that, in those cases where an internal aperture does not exist, the mucous membrane at the part in which the aperture would be situated if present is not only denuded, but rendered so thin that the perception of a probe through it is hardly less distinct than if it had entered the rectum; and that, if the incision extends to this point, the cure will be no less certain than if an opening into the gut had existed.

In regard to the importance of the principles thus established, I may, in the first place, remark that, limiting the incision within the narrow bounds that have now been mentioned, lessens not only the difficulty of its performance, and the suffering of the patient, but also the risk of hemorrhage, and the trouble of after-treatment; since, instead of having to keep separate the edges of a deep and not easily accessible wound, the surgeon has merely to prevent adhesion between

* Quarterly Journal of Foreign Medicine and Surgery, 1820.

the lips of a superficial cut. But the operation, while thus simplified in its performance, is also rendered more certain in its effect, since in cases of complete fistula the most extensive incisions will fail to afford permanent relief, unless they include the internal opening. I have, times without number, operated on complete fistulas that had been looked upon as blind external, from the internal orifice having escaped detection through unacquaintance with its position; and the repetition of operations for the disease, which are so frequently heard of in practice, are, with few exceptions, referable to this mistake.

In the reports of surgical cases which I have published from time to time since the year 1829, and also in the systematic work on Surgery, of which the first edition appeared in 1831, I have endeavored to explain and impress these principles, which have been uniformly acted upon in my own practice. They are still, however, far from being generally adopted, and many writers of high authority continue to inculcate the practice of Mr. Pott. Sir A. Cooper says:* "If the fistula does not open into the intestine you must pass the instrument (a bistoury) up the sinus till it reaches the extremity."—"A very copious hemorrhage generally follows the division of the septum," etc. Mr. Copeland says: "In this operation, though there are no vessels of very considerable size in danger of being wounded, yet, when the sinus extends far up the side of the gut, a hemorrhage now and then takes place, either at the time of the operation, but more usually a few hours after it, which, if it be not important from the magnitude of the divided artery, becomes often so from the difficulty, perhaps impossibility, of securing it by a needle and ligature."—"I will venture to say, that it (the hemorrhage) has occurred to almost every surgeon who is in the habit of performing the operation."—"After many unsuccessful attempts to secure a bleeding vessel under such circumstances, I once accomplished it by introducing a blunt gorget into the rectum; and, by keeping the gut thus dilated, I was enabled to see the orifice of the bleeding artery and to secure it."† Mr. Liston says: "Some contend

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* Surgical Lectures, p. 425. 1837.

† The bad effects of dividing the septum to its farthest extent are well illustrated by the following case which Mr. Copeland has given:

"A carpenter, about thirty years of age, had the operation for *fistula in ano* performed on him in the year 1803. There were two extensive sinuses in the nates divided; but the principal one extended above three inches up the side of the gut, and then perforated it; this also was laid open. There was considerable hemorrhage at the time of the operation; but the patient fainted and the bleeding stopped; and, when the wound was dressed, he went to bed. After he had been in bed about an hour the hemorrhage returned, and the

that fistulæ are always complete, that they commence from within, and that the internal opening is always at one particular point; but such, according to my experience, is very far from being the case."—"Having reached the extreme depth of the canal, the direction of the instrument's point is changed, so as to apply its cutting surface to the coats of the bowel at that part."*

Having so long contended in favor of the almost constant presence and fixed position of the internal orifice, I am happy to observe that Sir B. Brodie now advocates the same doctrine.

"The first thing to be done is to find the inner opening. I do not say that you will always succeed in finding it—certainly not the first time, but you will rarely fail if you look for it in the right place. Formerly, I often failed, and for this reason,—I did not know where to look for it. I used to think that it was to be found in the upper part of the sinus, but it is never found there if the sinus runs high up. You must search for it immediately above the sphincter muscle."†

This was the author's doctrine in 1844, while it had been expressed in the following terms only eight years before, in 1836: "If the internal opening be at the upper extremity of the sinus, the operation is simple enough; you introduce the fore-finger of one hand into the rectum, and with the other hand you direct the curved probe-pointed bistoury through the external opening into the sinus, and afterward through the internal opening into the rectum; then, keeping the probe-point in contact with the fore-finger, you draw the instrument downward, dividing all the parts below it.

"If the internal opening be anywhere in the middle part of the

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bleeding artery was so high up the sinus as to be entirely out of the reach of the needle and ligature; the gut, therefore, and the wound, were filled up with compresses of lint, wet with spirit of turpentine; and, for some time, it was thought that this mode of compression had succeeded in stopping the hemorrhage; but, during our fancied security, his pulse became hardly perceptible, his lips pale, and the whole of the body was in a cold sweat. He was now supported by wine and other cordials; and, in a short time, the hemorrhage burst out again with as much violence as ever, and continued for more than an hour. All the compresses were now removed, the rectum cleared as much as possible of coagulated blood, and the wound left without any dressings. The hemorrhage stopped, and did not return again; but very large quantities of coagulated blood were evacuated with the feces for three days afterward. He was, as may be supposed, extremely debilitated by this loss of blood, but finally recovered his strength, and his fistula was dressed and cured in the usual way." —On Diseases of the Rectum and Anus, pp 159–161, 3d edition.

* Elements of Surgery, vol. iii. pp. 70–82.

† Lancet, 26th January, 1844, p. 533.

sinus, you proceed in the same manner; but a second incision is then necessary, to lay open the upper extremity of the sinus. The probe-point of the bistoury must be made to penetrate the tunics of the rectum before this second incision is made.

"If the sinus has no communication with the rectum, the tunics of the latter must be penetrated as near as possible to the upper extremity of the sinus, the incision being made afterward in the manner which has been just explained."*

Believing that the principles which I have endeavored to explain are calculated to save much suffering, I think it right to state them in a condensed form.

1. *Fistula in ano* originates from an abscess in close connection with the mucous membrane, but exterior to it.

2. The internal opening is of secondary formation, and does not lie farther from the anus than an inch and a quarter, but is frequently much nearer to it.

3. In external fistula not communicating with the gut, the mucous membrane is always denuded for some extent at the part where the opening would be if there were one.

4. In performing the operation it is merely necessary to divide the parts lying between the external and internal apertures, or the denuded part of the mucous coat corresponding to the latter.

5. In the after-treatment it is not necessary to interpose any dressing between the edges of the wound beyond the first forty-eight hours.

Having thus endeavored to explain the pathology and treatment of fistula in general, I may now consider more particularly the different stages of the complaint.

When the formation of matter in the vicinity of the anus is threatened by the occurrence of pain, hardness, or swelling of the part, it is usual to abstract blood locally by leeches or cupping. Some temporary relief may thus be obtained,—but the improvement is neither complete nor permanent, and the progress of the complaint, though it perhaps becomes more slow, is not less troublesome,—being rendered sluggish and unmanageable. The application of heat and moisture by means of the hip-bath or fomentations has a very soothing effect on the patient's uneasy feelings, and accelerates the termination of his complaint, either by inducing resolution of the inflammatory action, or promoting suppuration. Evacuation of the bowels should be facilitated by the administration of gentle laxatives, such as castor oil, and injections of warm water into the rectum; and the patient

* London Medical Gazette, pp. 183, 184. 1835–36.

must confine himself to the horizontal posture, as well as the antiphlogistic diet, with strictness in proportion to the acuteness of his symptoms.

So soon as fluctuation is perceived, or the presence of matter may be inferred from the duration of symptoms, the fluid should be evacuated, to relieve the patient's uneasiness and prevent diffusion into the neighboring loose cellular texture, which might be the foundation of troublesome sinuses. The knife is now almost exclusively employed for this purpose, and a free incision is made by it from the hip toward the anus, through the center of the undermined integuments. Poultices are then applied for a few days until the inflammatory engorgement subsides, after which the cavity gradually contracts, and the case passes into the condition of a sinus or fistula. It might be thought better to divide the septum between the abscess and gut in the first instance, and some practitioners have advised this to be done. But it appears that recovery after the operation is not so speedy or so certain when it is performed thus early as when it is delayed until the textures affected are allowed some time to regain their natural state.

In examining a case of fistula with the view of operating, the forefinger of the left hand should always be introduced into the rectum, while the probe is guided with the other, since unless this be done it is almost impossible to discover either the existence or the position of the internal opening. The probe should be slightly curved, and have its concavity turned toward the opposing finger, which is often able to detect the orifice, or rather the irregular induration surrounding it, and thus assist in directing the instrument. If there is no internal opening the same exploration will discover the denuded part of the mucous membrane which occupies its place, and equally with it determines the limit of the incision. As the fistula is situated most frequently at the side of the anus, and very rarely either behind or before it, the most convenient position for the patient in general is stooping forward, with the arms resting on a table or chair. But when the orifice happens to be on the left side, unless the surgeon is ambidexter, the patient should be placed on his back with the limbs elevated. Females should lie on their side.

In performing the operation, a knife narrower in the blade, particularly at the point, and less curved than the bistouries in common use, will be found the most convenient. It should be gently insinuated up along the fistulous canal, while the operator's finger in the rectum assists in guiding its direction, and passed through the internal aperture if there is one, or pushed through the mucous membrane if it still remains entire; the point, resting on the finger, is then brought

out of the gut; after which, by a sawing motion of the blade, or a steady movement of it onward, the septum is divided almost instantaneously, with little pain, and hardly any bleeding. When much difficulty has been experienced in finding the internal opening, it is a prudent precaution, especially for a surgeon not much practiced in the operation, to push the probe through the sinus so as to bring its point out at the anus, before using the knife, since it is thus impossible to miss the orifice by transfixing the thin membrane which surrounds it. If any sinuses extend under the integuments of the hip or perineum, they should now be laid open with the knife, and then small pieces of dry lint are placed between the cut edges. This dressing will require to be renewed on the following or second day, when the patient's bowels have been moved, and after this a pledget of lint, moistened with a weak solution of sulphate of zinc, or water alone, and covered with a piece of oiled silk, to prevent it from drying, may be placed over the wound until the cure is completed. A T-bandage, or couple of handkerchiefs put on in this form, will enable the patient to keep the dressing applied without confining himself to the horizontal posture, which beyond the first day or two is quite unnecessary. Great attention to cleanliness will be required, and frequent ablution with soap and water contributes not only to comfort, but also to a speedy recovery.

What has now been said relative to the treatment of *fistula in ano* applies to those cases of the disease that admit of remedy, which fortunately constitute a large proportion of the whole. But before determining to operate, or holding out the probability of relief from doing so, it is necessary to ascertain that no obstacles exist likely to frustrate the surgeon's efforts and disappoint the patient's hopes. The most common of these opposing circumstances is a phthisical condition of the patient, which, as has been already observed, powerfully predisposes to the disease, and in the event of an operation being performed, is apt either to impede the healing of the wound, or cause a relapse through the formation of new abscesses. Any tendency to this condition, therefore, should render the prognosis in respect to an operation more or less unfavorable, though its performance cannot always with propriety be declined. Patients after exhibiting symptoms of pulmonary disease frequently recover so as to live for many years nearly or altogether free from complaint; and while the issue of their principal disorder is thus uncertain, it would be wrong to withhold the chance of recovery from the minor one, which often occasions more anxiety than the other. The refusal to operate is also apt to cause great discouragement; and the slight incision which has been

shown to be all that is necessary for curing the disease, if it has not the effect desired, at least makes the patient more comfortable, by lessening the irritation of the parts concerned and moderating the discharge. In these circumstances, unless the fatal disease is so far advanced as to render even the slightest surgical interference improper, though the operation for fistula may not with prudence be proposed or urged in consumptive cases, it may be performed if desired by the patient.

Fistulous openings near the anus, and leading into the rectum, sometimes communicate also with the urethra. The origin of this complicated form of the disease is an abscess situated between the prostate gland and perineum, which, from not being evacuated early by incision, discharges its contents into the urethra and rectum, before overcoming the resistance to an outward course, which is opposed by the fascia of the perineum, so that when at length openings do take place in the skin they are usually situated at the verge of the anus and root of the scrotum. Flatus and thin feculent matter escape by the urethra, urine issues from the rectum, and a copious fetid discharge proceeds from the external orifices. The patient suffers great and unceasing distress, and, unless relieved by efficient treatment, ultimately sinks under the continued irritation and exhaustion.

These formidable consequences of allowing the abscess to open spontaneously render it incumbent on the surgeon to be careful in his examination for recognizing the disease at an early period, and in giving free vent to the matter by an ample incision through the integuments and fascia of the perineum. The disease is generally induced by exposure to cold. It commences with pain in the region of the prostate gland, aggravated by micturition and going to stool, and is attended with more or less fever. When the matter begins to accumulate, difficulty is experienced in voiding the urine, sometimes to the extent of complete retention, and requiring the catheter to be introduced. The patient may continue in this state without any alteration, except the occasional occurrence of rigors, for eight or ten days or even longer, until the fluid makes a way for its escape. The perineum when examined is usually found to be fuller than natural. But, as the integuments retain their ordinary color and consistence, this change may readily escape observation; and fluctuation, owing to the depth of the abscess, can hardly be perceived, unless the finger is introduced into the rectum, through the coats of which the fluid is easily felt. I have frequently been asked to draw off the water when obstructed in this way, without any suspicion having been excited as to the cause of difficulty, and have known the practitioner first take alarm from ob-

serving that the catheter contained pus. Examination by the rectum, together with the history of the case, will leave little room for doubt as to the existence of matter. But if there should still be any uncertainty, it will always be right to make an incision in the perineum, since this can do no harm, and the withholding of it exposes the patient to the danger of all the distressing consequences that have been mentioned as resulting from spontaneous evacuation of the abscess. This incision should be made not at one side but in the raphe or central line of the perineum, so as to afford a direct as well as free drain for the matter.

When the disease has advanced to its fistulous state, it is necessary to lay open the sinuses; and even then the recovery is not always speedy or complete. The operation should be commenced by dividing the septum between the gut and the cavity left by the abscess. For this purpose the knife is introduced into the orifice which lies nearest the verge of the anus, guided upward until it enters the gut, and then carried outward through the septum, which in this case is generally more extensive than in an ordinary fistula, from the internal orifice being seated higher, even above the inner sphincter. The sinuses which extend between the anus and scrotum are next to be laid open, and then pieces of dry lint are inserted between the cut edges. The deep incisions which are sometimes required expose the patient to the danger of hemorrhage; and if there should be any appearance of this, the bleeding vessels are if possible to be tied, or the wound may be carefully stuffed with lint, the hips being elevated and having cold applied to them. After the cure appears to be complete, a very small fistulous communication is apt to remain between the urethra and rectum, allowing a few drops of urine to pass occasionally. If this does not close within a moderate time, or proves annoying to the patient by exciting his alarm, a red-hot iron wire should be introduced into the orifice, exposed by a speculum, as often as may be necessary for inducing contraction and obliteration of the slender canal. In all cases of this kind, especially those which have been long established, it is proper to search the urethra for stricture; since this additional complication is not unfrequently met with, whether as a cause or consequence of the fistula it is not always easy to determine.

Fish bones and other bodies of a similar form are occasionally arrested in their passage through the alimentary canal by the *sphincter ani*—and may then penetrate the coats of the gut, so as to cause the formation of an abscess, which of course will not admit of being healed so long as the irritating substance remains. It is only by examination with the probe or finger that this complication can be dis-

covered—the patient seldom being aware of having swallowed anything improper, or at all suspecting the cause of his complaint. When the nature of the case has been ascertained, the fistula should be laid open in the ordinary way; and then, if necessary, more extensive incisions may be made, to permit extraction of the foreign body without violence, or tearing of the surrounding parts.

Fistula in ano is sometimes found associated with stricture of the rectum, and in this case has been attributed to the resistance which is opposed to the passage of the contents of the rectum by the preternatural contraction of the gut. If so, the orifice ought to be situated higher up than the stricture; instead of which it occupies the usual position, about an inch from the anus. If the stricture, therefore, has any share in causing the fistula, it must act merely by exciting irritation in the neighborhood. In regard to the performance of the operation, the presence of a stricture does not require any deviation from the usual course of proceeding; but the recovery of the patient will of course depend upon the practicability of restoring the rectum to its natural capacity and texture.

The abscesses which result from the *Morbus coxarius*, or hip disease in its advanced stage, generally open in the lower and back part of the hip; but those which proceed from caries of the sacrum, and those connected with exfoliations from the ischium or pubis, discharge their contents near the anus, so as to present the appearance of ordinary fistula at this part. It is obvious that, if the sinus depends upon caries, it will not be benefited by any extent or number of incisions, and that if it leads to an exfoliation, the detached portion of bone must be extracted as an essential step to recovery. Many years ago I was asked to see a young man who had suffered repeated operations for what was supposed to be *fistula in ano*, without obtaining relief, and had at length become so much exhausted as to have lost all hope of recovery. A careful examination led to the discovery of an exfoliation lying inclosed in a capsule of cartilaginous firmness, formed by the origins of the flexor muscles of the knee, from the tuberosity of the ischium. After the extraction of this piece of bone, the patient quickly recovered and completely regained his strength. More lately I saw a young woman who had suffered from *fistula in ano* for five years, and wished to have the operation performed. On introducing the probe I felt it grate past a hard surface, and extracted a thin scale of bone, which had probably been detached from the arch of the pubis, as she attributed her complaint to a strain sustained in hastily descending from the roof of a coach.

CHAPTER II.

HEMORRHOIDS.

The expression Hemorrhoids, in the meaning usually applied to it, comprehends various tumors which are formed at the verge of the anus. It thus denotes a disease of more frequent occurrence than perhaps any other to which the human body is subject, few people, especially those in easy circumstances, who have reached the middle period of life, being entirely free from it in one form or another. The morbid swellings do not all possess the same constitution and characters, but differ in both of these respects so widely as to require being divided into three distinct sorts. In the *first* place may be mentioned those which depend upon enlargement of the veins at the extremity of the rectum,—*Secondly*, those termed External Hemorrhoids, formed by enlargement of the thin skin and subjacent cellular texture, which, lining the orifice of the gut, and connecting the mucous membrane of the bowel with the external integument of the body, though naturally seated neither within nor without the sphincter, projects beyond it when distended by inflammatory enlargement,—*Thirdly*, those which consist of a vascular development of the mucous membrane, constituting tumors that possess a great tendency to bleed when protruded beyond the anus. They do not occupy this position except in consequence of exertion in the erect posture, or the expulsive efforts employed for evacuating the bowels; and so soon as these causes cease to operate, or pressure is applied externally, they return into their proper place within the sphincter, whence they are named Internal Hemorrhoids. Before particularly considering the structure, symptoms, and treatment of these tumors, it will be proper to inquire generally into the circumstances which give rise to their formation.

CAUSES OF HEMORRHOIDS.

Whenever the bowels are evacuated, more or less of the lining membrane of the anus is everted, and distended by the resistance which is then opposed to its venous circulation. Constipation, by rendering the expulsive efforts more prolonged and laborious, must increase this

effect, and tend to produce permanent enlargement of the protruded part. But constipation usually depends on errors of diet or regimen, particularly redundant nourishment and deficient exercise, causing derangement in the healthy action of the digestive organs, which not only leads to irregularity in the evacuations, but likewise, through the medium of constitutional disturbance, proves a fruitful source of local disease; and as the parts about the extremity of the rectum, as has just been explained, are in such circumstances exposed to more than usual irritation, it is not surprising that they should frequently become the seat of morbid action. The disease being once established, will promote its own increase by impeding evacuation of the bowels, and from the pain as well as hemorrhage which may attend it, deranging the healthy action not only of the digestive organs, but likewise of the whole system. Pregnancy, enlargement of the liver, and other abdominal tumors, by opposing a free return of blood from the pelvis, will favor the production of hemorrhoids, especially those which depend upon a varicose state of the veins. In addition to the exciting causes which have been mentioned, it would appear that a predisposition to the disease frequently exists, since in some people it is induced much more readily than in others. Persons thus prone to the complaint occasionally suffer from it at the age of puberty; but it seldom proves troublesome until the frame is fully developed, and is generally most distressing from the age of twenty-five to sixty.

VENOUS HEMORRHOIDS.

The lower part of the rectum is supplied with numerous veins lying under the mucous membrane, through which they may be readily distinguished. These vessels in the neighborhood of the anus are liable to varicose enlargement, and then present the appearance of irregular tumors encroaching on the cavity of the gut. They may extend for an inch or more above the anus, but do not show themselves beyond it, unless the nates are held aside, when they are to be seen projecting from the sides of the orifice. They possess a round form, dark color, smooth surface, and tense consistence. The veins thus altered are liable to inflammation of the same subacute kind to which the varicose *vena saphena* is subject. In this state the tumors become larger, harder, and excessively painful, especially when in the slightest degree compressed, so that sitting and evacuating the bowels occasion great distress. The blood circulating through them frequently coagulates during such attacks; and if it subsequently undergoes absorption, a spontaneous cure may be accomplished. At other times suppuration

ensues in the surrounding cellular substance, and may thus lay the foundation of *fistula in ano*. A discharge of blood also occasionally proceeds from ulceration of the enlarged veins, just as happens in the leg.

This form of the disease formerly attracted more attention than either of the others, and has even been supposed to be the sole cause of hemorrhoidal swellings. In a slight degree it is certainly very common, and to this extent frequently exists, along with enlargement of the neighboring textures; but without such complication it comparatively seldom attains sufficient size to produce much inconvenience. The situation of the visible part of the tumors, neither within nor altogether without the sphincter, together with their form, consistence, and color, renders their recognition very easy. In regard to the treatment, the tendency of the venous tissue to recent irritation seems to forbid any operation, and render excision as well as puncture dangerous. But the veins affected are extremely small immediately beyond the enlarged portion, and no inconvenience is experienced in practice from inflammation of the vessels when the tumors are cut out or simply evacuated by a puncture, provided coagulation of their contents has taken place. In the latter way relief is afforded at once on very easy terms, and it is only in case the patient objects to this being done that soothing measures, such as rest in the horizontal posture, gentle laxatives, as castor oil, injections of tepid water into the rectum, and the hip-bath will be required. When the symptoms are severe, leeches may be placed round the anus, opiate injections should be administered, and lotions, containing acetate of lead with opium, applied to the inflamed parts. By these means the paroxysm is subdued in the course of a few hours, or days at the furthest; and by care afterward in guarding against the causes of excitement, future attacks may be either prevented or rendered less distressing.

EXTERNAL HEMORRHOIDS.

The thin skin which connects the internal mucous and external cutaneous covering at the anus, like the same texture in other situations, such as the lip and prepuce, is liable to swelling, from distention of the loose cellular substance which lies under it. Any irritation in the vicinity may occasion this; and the derangement once induced contributes to its own increase, by causing protrusion of the affected part beyond the sphincter, and so promoting the tendency to inflammatory engorgement by impeding the circulation. A tense red tumor, or series of tumors, may then be seen at the margin of the anus, easily

distinguishable from varicose veins in the same situation, by their florid color, pyriform shape, and more yielding consistence. In other respects the symptoms are nearly the same. The inflammation usually terminates in resolution, but sometimes leads to suppuration, and also, though very rarely, proceeds to mortification. When the engorgement attending the excited action subsides, the distended skin may resume its natural condition completely, but, in general, does so only partially, and remaining relaxed, constitutes a permanent pendulous fold at the orifice of the gut, always ready to resent any irritation and swell to its former or even a still larger size. The external pile thus constituted generally contains interspersed through its substance small venous cysts arising from a varicose state of the vessels.

The artificial mode of life which results from the usages of civilized society tends so strongly to the production of hemorrhoidal disease, that few people remain altogether free from it; and this form is the one which it most frequently assumes, often existing independently of any other morbid affection, and very generally accompanying other diseases of the rectum. Various methods have been pursued in the treatment of external hemorrhoids; but it is needless to mention any other than excision, since this is undoubtedly the best mode of removing them. Scissors curved to one side will be found the most convenient instrument for the purpose, and may be employed either alone, or with the assistance of double-pointed forceps to steady the tumors during their separation. The operation is very easy, and attended with little pain or bleeding. It is also quite effectual. The best time for its performance is when the hemorrhoids are in a quiescent state; and it should always be insisted upon when they are present in a case requiring any other operation, since unless removed previously, or at the same time, they would be apt to suffer from the irritation, and, by adding the complication of inflamed piles, greatly increase or prolong the patient's sufferings. The blades of the scissors should be directed from the circumference toward the center of the anus, in order to get at the root of the tumors, unless the whole circumference of the orifice is affected, when a circular portion of the relaxed integuments should be removed. A piece of dry lint is the only dressing required in the first instance, and generally proves sufficient, as the raw surface readily contracts and heals. If necessary, a sulphate of zinc lotion may be applied.

While the hemorrhoids are suffering from inflammation, excision may still be practiced, and it should be resorted to if the patient is willing to endure the pain that attends cutting in this state, in order to get speedily relieved from the complaint. If it be thought better

to delay the radical cure until the parts get into a condition more favorable for its easy performance, the same soothing means that have been already mentioned as proper in the treatment of inflamed venous hemorrhoids should be employed. Unless the tumors are very tense, it is also useful to make gentle pressure on them, to unload their vessels and promote their return within the sphincter.

As excision always affords an easy, safe, and effectual remedy for external hemorrhoids, it seems unnecessary to say much of the other means which have been proposed, and more or less extensively adopted. The ligature is decidedly objectionable, as being infinitely more tedious, and also more painful than the knife or scissors, without any compensating advantage. The application of astringent ointments, such as the *Unguentum Gallarum*, is very inefficient, and calculated rather to amuse the patient than to afford him any real benefit; and the introduction of bougies can hardly produce more than a little temporary relief. The best palliatives are attention to regimen, the use of gentle laxatives, such as sulphur with cream of tartar or magnesia, and Ward's paste, which in all diseases of the rectum attended with relaxation has often a remarkably good effect. A portion of it, about the size of a nutmeg, may be taken twice or thrice a day. Of local applications the ointment just mentioned, together with an admixture of opium, or subnitrate of bismuth, may be regarded as the best. Or the tannic acid and muriate of morphia may be united with axunge, so as to form a colorless application.

INTERNAL HEMORRHOIDS.

The mucous membrane at the extremity of the rectum immediately above the thin skin, which is the subject of the last-mentioned swelling, is liable to a morbid development of its texture that gives rise to very serious symptoms. There are thus formed tumors seated altogether within the sphincter, unless when forced into view by sufficiently powerful expulsive efforts, and hence named Internal Hemorrhoids. They possess an irregularly round form, a florid color, a granular uneven surface, and a very vascular structure, so as to bleed freely from the slightest injury. They resemble a strawberry in appearance, and seldom existing singly, in general constitute together a more or less complete annular swelling, which, when protruded beyond the anus, seems to close the aperture of the gut, and is surrounded by an external ring proceeding from distention of the neighboring loose texture, which is the seat of external hemorrhoids. The two kinds of growths thus associated are easily distinguished, not only by their dif-

ference of position, the one being seated within the other, but also by their difference of surface, the one being smooth and cutaneous, the other granular and mucous.

The substance of the internal hemorrhoidal tumor is so vascular and disposed to bleed, especially when forced beyond the sphincter, that it has been considered similar to the erectile tissue which composes aneurism by anastomosis and nævus. But these diseases are, with few if any exceptions, of congenital origin; while internal hemorrhoids rarely make their appearance before the age of maturity; and the vessels of the latter growth, instead of being dilated into the cellular-looking structure which composes the former, are small and arborescent. There hence does not appear to be any analogy between the two morbid structures further than their disposition to bleed.

How this growth of the mucous membrane originates it is not very easy to explain. The circumstances which have been mentioned, as accounting mechanically for distention of the veins and swelling of the lax textures at the verge of the anus, cannot operate here; and we must be satisfied with inquiring into the causes which operate less directly in producing the disease. Like other hemorrhoidal affections it occurs chiefly in the vigor of life. It is much more common in males than females, and in both sexes greatly more frequent in the higher than the lower ranks of society. Residence in warm climates, a luxurious diet, deficient exercise, and excitement of the generative organs are the circumstances which seem to have the most powerful influence in determining its commencement and encouraging its progress, especially when several of them operate together. Literary pursuits and a professional life, by occasioning sedentary habits, are observed to favor the production of this morbid excrescence. It would seem, in short, that the superfluous nourishment usually acquired by persons in easy circumstances, when not expended in bodily exertion, is apt to find vent through the channel of internal hemorrhoids, into which it may be directed by the opposition afforded by a sitting posture to the free return of the blood circulating in the pelvic viscera.

The symptoms which attend this kind of hemorrhoid may be divided into three sorts, namely, painful sensations, protrusion of the tumor, and hemorrhage. Some patients complain of all these inconveniences equally; others complain of them singly. But in general they are present together, while one of them predominates by its severity, and the attention consequently bestowed upon it. The painful sensations are referred either to the seat of the disease itself, or to the urinary organs, with which the rectum is intimately united in sympathy. The pain of the swellings is sometimes described as dull and oppressive, at

other times sharp and lancinating. The irritation of the urinary organs occasions uneasy feelings in the course of the urethra, frequent desire to make water, and difficulty in doing so. There is no regular proportion between the extent of the disease and the severity of its symptoms, nor is there any difference observable in the appearance of the tumors adequate to account for the variety which occurs in the nature as well as the degree of the annoyance occasioned by them, and which no doubt must depend upon individual peculiarities of local or constitutional irritability. A gentleman, about thirty-five years of age, complained of pain at the extremity of the rectum, which was seldom entirely absent, and from which he occasionally suffered so much as to feel quite unhinged and incapacitated for any exertion either of body or mind. On examination I could find no morbid appearance except a very small internal hemorrhoid, not larger than the point of the little finger, the removal of which completely relieved him. The urinary symptoms are sometimes so prominent as to call attention from the true seat of the disease. A gentleman, about fifty, suffered for years from excessive pain in the region of the bladder, with frequent desire to make water. He consulted a great many physicians and surgeons of eminence, and had at length made up his mind that the disease, in accordance with the opinion of a distinguished pathologist, was tic-douloureux of the bladder, when a medical friend thought of examining his rectum, and discovered several large internal hemorrhoids, which I removed with the effect of affording complete relief.

The protrusion of the swellings is a nearly constant symptom of the disease, and is troublesome in proportion to their size. At first the tumors pass beyond the sphincter only during the forcible and continued efforts to evacuate the bowels which attend constipation; but by-and-by they descend more readily, and return with more difficulty, requiring to be pushed up by external pressure; and in cases of old standing, where the skin lining the anus, from being frequently put upon the stretch, remains permanently relaxed, hanging in folds round the orifice, the tendency to protrusion is so great that the hemorrhoids descend not only upon occasion of going to stool, but also whenever the patient makes the slightest exertion, or even when he simply assumes the erect posture. The protruded part is of course painful, especially when subjected to pressure; and, by soiling the patient's clothes with the mucous and bloody discharge that issues from its surface, is a constant source of annoyance. A middle-aged lady, whom I saw with Dr. Begbie, had been confined for two years to the horizontal posture by hemorrhoidal swellings, which descended from the

gut whenever she attempted to walk or stand. After the disease was removed she could walk for miles without any inconvenience.—A gentleman, about fifty, whom I saw with Dr. Davidson, had suffered for upwards of eighteen years from a protrusion of this kind, and, holding an office in the courts of law, which frequently required him to sit for many hours, in public, endured more distress than it is easy to describe or imagine. He was completely relieved by removal of the enlargement.—A man, about forty, from Dundee, was in the hospital here under my care on account of a hemorrhoidal protrusion, which had troubled him for more than twenty years, and latterly disabled him entirely for his occupation, which was that of a weaver. He returned home quite well.—Cases without end could be mentioned in illustration of the protrusion of the tumors constituting the prominent feature of the disease. It is such cases which generally go under the title of *Prolapsus ani*, and, being supposed to depend upon weakness of the sphincter, are palliated very imperfectly by the application of bandages to support the gut. Such means of palliation are no less unpleasant than inefficient, and in some respects, indeed, may be considered as even more irksome than the disease itself. It is therefore of the utmost importance to take a correct view of the derangement, which leads to an easy, safe, and effectual remedy.

The bleeding which proceeds from internal hemorrhoids is the most alarming symptom attending the disease, and the one which occasions the most serious effects. It takes place when the tumors are protruded beyond the sphincter, and varies in amount from a few drops to several ounces. The blood sometimes seems to ooze from the surface, and at other times springs out in a jet, extending, if permitted, to the distance of several feet; whence it is often supposed that the patient has ruptured a blood-vessel. The quantity lost at each time of going to stool is very unequal, and varies with the condition of the patient, increasing when there is general irritation of the system or excitement of the pelvic viscera, and diminishing in circumstances of an opposite kind. For weeks or months the hemorrhage may cease altogether, and then return more vigorously than ever; but its general tendency is to increase with the duration of the complaint. At its commencement the discharge of blood may in some instances be regarded as salutary, as it occasionally seems useful in relieving other parts of the system from oppression. But when it becomes habitual and copious, besides the unpleasant feelings connected with it, very serious derangements of the system are apt to be produced. The patient loses flesh, and acquires a remarkable paleness of complexion, which is afterward exchanged for a peculiar dingy yellow hue, like that of imperfectly

bleached wax. The lips no longer possess their vermilion color, and resemble those of a dead body; the tongue too has a blanched appearance very characteristic of the state induced by excessive or continued depletion. These symptoms are attended with great listlessness, or want of energy both of body and mind, disturbed sleep, irritability of temper, quick pulse, and headache, which is generally increased by rising up more than by lying down. Palpitation and pain in the region of the heart, and difficulty of breathing, are also frequently induced by slight exertion or agitation of any kind. In advanced stages of the disease there is sometimes œdematous swelling of the feet and legs. A fixed pain in the region of the colon, especially on the right side, occasionally also proves troublesome—and, together with irritability of the bowels, is apt to distract attention from the real seat of disease, by simulating chronic dysentery; while derangements of the stomach proceeding from the same source are often treated under the title of dyspepsia.

It is obvious that the condition which has now been described must not only prove very distressing in itself, but tend to the production of other serious diseases; and, therefore, ought to be remedied with the least possible delay whenever ascertained to be present. A popular prejudice has existed against interference with bleeding piles, on the ground that harm may arise from suddenly checking a habitual discharge; but the worst consequences thus anticipated are hardly to be dreaded more than those directly sustained from the disease; and the result of experience is quite opposed to the apprehension of harm being so produced. In illustration of the safety with which the hemorrhage may be arrested, even when of the longest standing and greatest extent, I may mention the case of a lady whom I attended with Dr. Donaldson of Ayr. At an early age she had begun to suffer from hemorrhoids, and thirty years before I saw her had been advised by Mr. Benjamin Bell to have them removed. This was declined, and the disease went on increasing with all the usual symptoms, until at length the bleeding, which for seven or eight years had been very profuse, so affected the general health as to excite the serious alarm of her friends. She exhibited in an extreme degree the peculiar aspect and other symptoms of exhaustion caused by a continued drain of blood. But very soon after the removal of the hemorrhoidal tumors, which were large and numerous, so as to encircle the aperture of the gut, she regained her strength and healthy look; and though many years have now elapsed since the operation was performed, she has not suffered any unpleasant symptoms from the sudden suppression of her complaint.

The existence of bleeding from internal hemorrhoids frequently escapes the observation of the medical attendant, from the patient carelessly overlooking or willfully concealing it. In females, the delicacy of the sex, which is an additional obstacle to discovering the disease, should excite corresponding vigilance on the part of the surgeon; and whenever there is any ground for suspecting its existence, an examination of the bowel in its most protruded state should be insisted upon before giving any opinion of the case. It is also very necessary to beware that the symptoms, especially those connected with the circulation, do not obscure the nature of the disorder and make it appear to depend on what are really its secondary effects. As an instance of this, I may take the case of a gentleman, about forty, an English commercial traveler, whom I saw with Mr. Alexander. He had labored long under what was supposed to be disease of the heart, and been treated for this complaint by one of the most eminent provincial physicians in England. His waxy look, bloodless lips, and defective energy, together with irregular action of the heart, certainly afforded considerable ground for this opinion; but Mr. Alexander discovered that there was an internal hemorrhoid, which bled profusely every time the patient went to stool, and I removed it, with the effect of quickly restoring him to health. There is reason to fear that in such cases as this the cause has not only been mistaken for the effect, but may even have been supposed to exert a salutary influence in moderating the violence of its action,—in other words, that the flow of blood from the rectum has been supposed to depend upon disease of the head or heart, and to be useful in lessening its force. Such erroneous views may have led to the equally erroneous practice of abstracting blood artificially in these circumstances; the effect of which may be easily imagined.

The treatment of internal hemorrhoids is generally regarded with much uncertainty and apprehension, from the conflicting opinions of practical writers on the subject, and the disagreeable results of some methods which have been pursued. Excision is certainly the quickest and easiest mode of removing the tumors, but is very apt to occasion a serious or even fatal hemorrhage. The blood does not readily escape externally, but, accumulating in the rectum, excites the desire to go to stool, and is then voided in the form of a dark-colored feculent-looking fluid, which may impose upon the attendants and conceal from them the true situation of the patient. Sir A. Cooper has related the case of a Scottish nobleman who perished in this way, and several other instances of the same kind. If other practitioners had been equally candid, we should doubtless have had more testimony as to the danger

of this operation; and every surgeon who has practiced it must have experienced more or less alarm. Before my own views were settled as to the best means of treating the disease, I on one occasion cut away an internal hemorrhoid, which was partially protruded, and found it necessary to employ manual pressure for several hours to restrain the bleeding that followed. In another case of the same kind, I succeeded in securing the vessels by ligature. In order to obviate this danger, it has been proposed to transfix the base of the protruded part with pins, to prevent the raw surface from being drawn within the sphincter until the bleeding ceases or is arrested by ligature. But it is to be feared that the hemorrhage, though prevented so long as the part was kept tense by the pins, might occur after their removal, unless they were allowed to remain until the orifices were sealed up with lymph, which could not be done without the risk of exciting inflammation and constitutional disturbance, to say nothing of the prolonged confinement and distress necessarily attendant upon such a mode of procedure. Indeed, from many such cases which have come to my knowledge, I feel satisfied that the danger of bleeding, however great it may be, constitutes but a small part of the risk attending excision of internal hemorrhoid, since the cause of death after such operation, so far as I have been able to learn, is usually inflammation spreading along the intestinal coats. It may escape observation or be mistaken for a dysenteric attack, and being quickly followed by sinking, is apt to be attributed to some specialty in the patient's system, while in truth entirely owing to the unsound principle of treatment. A gentleman from Glasgow consulted me for an ordinary growth of internal hemorrhoids, and was advised to have them removed by ligature,—but not wishing to displease his ordinary attendant, submitted to excision, and died within a fortnight. The officer commanding one of her Majesty's regiments recently returned to the south of England after long service in India, came to Edinburgh in quest of relief from very large hemorrhoidal tumors, which were protruded by the slightest exertion, and, indeed, could hardly be restrained at all within the sphincter. He said that before going abroad, he had some operation performed in Dublin, but obtained no relief; and latterly could not sit on horseback without placing his handkerchief rolled into a ball under him on the saddle, having upon one occasion in this wretched plight led his regiment into action—a greater effort of heroic resolution than can well be imagined by any one who is not familiar with the depressing influence of what is usually called prolapsus. I saw this gentleman with Dr. Alison, and at first felt doubtful how far any operative interference would be warrantable in consideration of the

patient's age and derangement of health consequent upon long residence in a tropical climate, but confiding in the safety of ligatures ventured to employ them with the happiest result. Encouraged by this success, the officer next in command, who was suffering from the disease though to a much smaller extent, went to London, submitted to excision, and died in a few days.

Excision being thus objectionable, caustics of different kinds, such as the concentrated mineral acids, and the actual cautery, have been employed for destroying the hemorrhoidal growth, and might possibly be so managed as to prove useful in doing so, if there were no preferable means of accomplishing the object. But as they are extremely painful, tedious, and uncertain, while there is another which perfectly attains all that can be desired in treating the disease, without any of these objections, I may proceed at once to speak of it, namely, the Ligature.

By applying a sufficient number of ligatures to the roots of the tumors they may be certainly removed without any danger of bleeding. But it has been alleged that, instead of this danger, another not less formidable is encountered in inflammation, spreading from the strangled parts, and either terminating fatally, or causing extensive suppuration and sloughing in the neighborhood of the anus. The seeming resemblance between the condition of an internal hemorrhoid, to which a ligature has been applied, and a strangulated hernia, makes it appear likely that this effect would follow the operation; but experience teaches, what a more careful analysis of the cases would lead us to expect, that the bad consequences thus anticipated do not really present themselves. In a strangulated hernia the circulation of the protruded parts is not entirely obstructed, but merely impeded, so as to cause irritation and inflammation, with its usual local and constitutional symptoms, aggravated by the importance of the affected part; while a hemorrhoid subjected to the ligature is completely detached from any share in the vital action of the system, which, consequently, cannot be influenced by its condition. Accordingly, however similar the two cases may appear at first view, their results prove very different; and I feel warranted, after very extensive employment of the ligature, to state that it may be used without the slightest risk of any serious inconvenience. Indeed, in the whole course of my practice, I never met with a case which either terminated fatally or threatened to do so, where the ligature simply was employed.

In order to account for the bad consequences which Mr. Copeland and others have related as occasionally attending the use of the ligature, it will be sufficient to remark, that if the threads are not drawn

tight,—if such large portions of the morbid texture are embraced by them as to prevent the degree of compression requisite for preventing altogether the circulation through the tumors,—or if the whole of the disease is not included, disagreeable effects may not improbably ensue. Sir A. Cooper has advised that the ligatures should not be drawn tight, with the view of lessening the pain caused by them. But, with all deference to his high and justly esteemed authority, I feel no hesitation in stating, that while the suffering of the patient cannot in this way be rendered less severe in the first instance, it will ultimately be much greater, as well as more prolonged, and attended with more danger of spreading inflammation, than if the strangulation had been completed at once. To lessen the pain, it has also been proposed to cut away the tumors, immediately after they are tied, close or near to the knot, which method, it is obvious, must be attended with another danger, since the ligature, when thus left unsupported, will be apt to slip off, and permit the vessels to bleed. If the threads are drawn tight they will not so readily quit their hold; but in this case no advantage can be derived from removing the strangulated parts, as they cease to maintain any living action, and very soon collapse into the form of flaccid bags.

I thought at one time that the best method of employing the ligature was to include at first only a small portion of the disease, with the view of avoiding any risk of exciting more irritation than the part or patient could safely bear; but I am now persuaded that by doing so, much greater pain and danger of undue excitement are occasioned than by the summary process of tying all the tumors at once. In illustration of this I may mention the case of an eminent provincial practitioner whom I attended many years ago with Dr. Abercrombie. He had long suffered from the bleeding of internal hemorrhoids, and was at length reduced to a state of extreme exhaustion. From being a strong muscular man, he had become a feeble emaciated invalid, unable for any exertion of body or mind, with the waxy look, frequent small pulse, and headache in assuming the erect posture, which characterize the state arising from continued depletion. As the tumors were large and numerous, I commenced the treatment by tying one of the smallest, with the view of ascertaining what degree of freedom might be used with the remainder. The ligature separated at the end of two days, but the other excrescences swelled and protruded from the anus to the excessive distress of the patient, who described his suffering as intolerable, and alarmed the neighbors by his cries. As his pulse suffered little alteration in frequency or hardness, and his belly continued free from pain, no apprehensions were entertained

as to the result. The inflammation accordingly did not extend beyond the limits of the diseased growth, the whole of which mortified and sloughed off, leaving the patient as it appeared completely freed from his complaint, though at the expense of much more suffering than had been anticipated. This same gentleman about two years ago again applied to me in even a worse state than upon the former occasion. His feet and legs were œdematous, his pulse was extremely frequent, small, and irregular, and the slightest exertion, such as that of ascending a few steps, always induced an attack of breathlessness that threatened to prove fatal. Though the tumors were nearly twice as large as they had been formerly, I did not scruple to include the whole of their extent in ligatures at once, and with the happiest effect, as he gradually regained the most perfect health both locally and generally without any untoward occurrence.

It is not difficult to explain why a partial operation should produce unpleasant effects. The morbid texture of the hemorrhoidal tumors, like all other formations not entering into the original constitution of the body, being prone to excited action, readily inflames when injured, and suffers more acutely than the natural textures. The slightest excitement is apt to make it swelled and painful, and when it is in part subjected to the ligature, inflammation more or less destructive of the remainder is thus occasioned, while, if the whole be included at once, the destructive process is accomplished with wonderfully little uneasiness. On the same principle any operation attended with local irritation in the neighborhood of internal hemorrhoids, is apt to be followed by troublesome consequences from their excitement. A gentleman came under my care for *fistula in ano* with this complication. I advised that both complaints should be remedied at the same time, to prevent the irritation caused by an operation for one of them from injuriously affecting the other. The patient, however, persisted in requiring the fistula to be cut by itself in the first place, which was done, and followed by a very distressing paroxysm of the hemorrhoidal disease. He returned to the country to recruit his health, and came back some weeks afterward to have the excrescence removed. Another patient came to be operated upon for fistula, and made no mention of any other ailment. I performed the necessary incision, and a day or two afterward was surprised to see a large internal hemorrhoid protruding from the wound. He then told me that he had long suffered from bleeding piles; and I expressed my regret that this communication had not been made sooner, as both diseases might have been remedied together, with less inconvenience than he was then suffering. It happened fortunately that the inflammation proved so

intense as to destroy the tumor, which sloughed off, so that the recovery was completed without any further operation, but certainly, as in the last case, with much more pain and confinement than if the hemorrhoid had been tied when the fistula was cut. Still pursuing the same principle, when any pendulous folds of skin are observed to surround the anus in a case of internal hemorrhoids, I should advise them to be removed with the scissors at the same time the ligatures are applied, lest they inflame and prove troublesome in consequence of the neighboring irritation.

When the operation is to be performed the patient should take a dose of castor oil, so as to evacuate his bowels previously to it, as they had better not be moved for forty-eight hours afterward. The hemorrhoids having been fully protruded by a sufficient degree of straining, the patient either stoops forward, resting with his arms on a chair or table; or if a female, lies on one side with the limbs drawn up, so as to expose the parts concerned. The surgeon then introduces the point of the fore-finger of his left hand within the ring which is formed by the morbid growths, and, keeping it there as a guide, transfixes the roots of the tumors in succession with a needle and double thread, directed from without inward through the center of each close to the base. The ligatures, which should be waxed silk, of ample strength, are next to be tied as tightly as possible, each of course including the half of a tumor. Their ends are then cut away as near to the knots as may be, without endangering their security; and the protruded parts are lastly pressed gently back within the sphincter. The whole of the skin surrounding the anus, which is relaxed or distended so as to constitute external piles, is then to be cut away either in separate portions, or in the form of a ring, according to its extent.

The symptoms consequent upon the operation vary with the extent of the disease and the irritability of the patient. There is seldom much, or indeed almost any complaint of pain, until the ligatures are tied; and the patient even then in most cases feels little inconvenience. The suffering which attends the next step of the process, however, is in general considerable, and often very severe, and the patient who may not have winced or groaned during the application of the ligatures is sure to complain while the scissors are employed to remove the hemorrhoidal swelling. The pain is most intense at first, and usually subsides gradually in the course of a few hours, until it is little or not at all perceptible. Want of sleep is frequently one of the effects produced, and is sometimes accompanied with nervous excitement, rendering the patient restless. The pulse is seldom much affected,

and when it does suffer disturbance, merely becomes quicker without any of the hardness which denotes an inflammatory state of the system. The bowels are constipated, so as not only to cease evacuating their contents spontaneously, but to require laxatives of greater power than is sufficient in ordinary circumstances. Difficulty of making water, sometimes amounting to complete retention, and requiring the catheter to be introduced, frequently occurs, but seldom continues beyond the first twenty-four hours, unless the bladder is unfortunately allowed to become overdistended. When the bowels are evacuated, which they should be not later than the second day after the operation, there is seldom any protrusion, and in general no bleeding. Little inconvenience is experienced after the unpleasant effects immediately consequent upon the operation have subsided, until the ligatures separate, which is usually about the end of a week; when a painful feeling is often complained of in the raw surface left by the sloughs, and a little blood is occasionally discharged along with the evacuations. Soon after this the irritated parts regain their natural condition, and all the disagreeable symptoms which proceeded from the disease, as well as those caused by the operation, completely disappear.

Such being the consequences of tying internal hemorrhoids, the treatment after the operation may be easily determined. An opiate, containing thirty drops of the solution of muriate of morphia, should be administered to the patient if he complains of pain, and be repeated from time to time if it continues severe or the want of sleep proves distressing. Fomentations may at the same time be applied to the anus. And if, notwithstanding the use of these means, suffering is still experienced, the hip-bath followed by poultices should be employed. The retention of urine if slight may be relieved by giving the *Spiritus Ætheris Nitrici*, or the camphor mixture; and if more obstinate, will require the catheter to be introduced occasionally so long as it lasts. The patient should restrict himself to the antiphlogistic regimen, and drink freely of simple diluents, such as barley-water or linseed tea, to lessen the acrimony of the urine. He should also confine himself chiefly to the horizontal posture until the ligatures separate. In general very little requires to be done in the way of treatment, the patient after the first hour or two usually suffering hardly any uneasiness, and even then scarcely more pain than what frequently attends the disease.

Before the first edition of this treatise was published, ligatures were little employed in the treatment of internal hemorrhoids; being, indeed, usually mentioned not for commendation, but rather avoidance, on account of the danger alleged to attend their use. The

decided testimony which I felt warranted to offer in favor of the facility, efficiency, and safety of this method, together with the success attending its practice on the principles above explained, has, I believe, had some effect in establishing the confidence which is now so generally placed in the ligature; and I venture to hope that ere long it will alone be employed for the purpose instead of the painful, uncertain, and dangerous means which are still not entirely abandoned. Very lately, a lady had the trouble of traveling six hundred miles to come here that I might relieve her from a disorder consequent upon the use of nitric acid for the removal of an internal hemorrhoid; and not long ago we heard of a valuable life being lost in one of the capitals of her Majesty's dominions, from the employment of the actual cautery for this purpose.

CHAPTER III.

PROLAPSUS ANI.

Next to fistula in ano, there is no term so frequently applied to diseases of the rectum as *Prolapsus ani.* Whenever protrusion of the lining membrane of the bowel takes place from straining at stool or any other sort of exertion, it is in general supposed to depend upon weakness of the sphincter muscle, and to require mechanical support for its relief or remedy. Now in a very large proportion of such cases there is no want of muscular power, but merely a morbid thickening of the mucous texture, which swelling so as to occupy and distend the sphincter, prevents it from contracting fully. The so-called "Prolapsus," therefore, is almost always nothing more than an internal hemorrhoidal growth, of which the removal is sure to afford complete and permanent relief. Considering how readily this may be accomplished, it is painful to reflect upon the number of persons whose existence is embittered by the constantly increasing annoyances of a complaint not only distressing through its direct effects, but if possible still more subversive of comfort by its enervating influence upon the frame generally. They too frequently either abstain from asking relief, under the impression that their disease is incurable, or aggravate their misery by the employment of mechanical support, afforded by bandages, recommended to them through the same erroneous impression on the part of their medical attendants.

In order to avoid this mischievous confusion, it should be understood that the protrusions usually comprehended under the title of prolapsus are of two distinct kinds: one being constituted by morbid growths of the lining membrane, or internal hemorrhoids; the other consisting of the intestinal coats retaining the natural texture, and simply displaced from their proper position within the sphincter. The latter sort of protrusions occur in consequence of some local irritation, such as that of a stone in the bladder, or a morbid state of the bowels inducing violent expulsive efforts on the viscera of the pelvis; and also, independently of any undue force, from a relaxed condition of the sphincter, permitting a portion of the bowel to descend from its own place. These two forms of the disease might be distinguished as the prolapsus from irritation, and the prolapsus from weakness.

PROLAPSUS FROM HEMORRHOIDS.

With regard to the nature, symptoms, and treatment of this morbid derangement, I may refer to what has been said under the head of Internal Hemorrhoids. But as the diagnosis cannot be too strongly recommended to attention, some additional remarks upon this part of the subject may here be added.

When hemorrhage, pain, or urinary irritation are prominent symptoms of the case, its true nature, though frequently overlooked, is less apt to be mistaken than when little inconvenience is experienced in these ways, and the annoyance chiefly suffered is from protrusion being induced by exertion. It is then that the unfortunate appellation of Prolapsus or "falling down" of the gut is most apt to exclude the patient from any hope of effectual relief, and either consign him to the misery of brooding over his complaint in silence, or deliver him to ignorant and designing empiricism. If it were consistent with the plan of this treatise, I could relate histories of the distress thus experienced in all ranks and almost every occupation of life during long series of years, with such effects upon mind and body as to suggest the inquiry how far character and conduct may often have depended upon a complaint so strictly local and easily remediable.

Patients laboring under this tendency to protrusion generally suffer more or less from derangement of the digestive organs, attended with various unpleasant symptoms, for which they are wont to require the aid of physic; and as some temporary benefit may be derived from this source, the evil is allowed to pursue its course under a system of imperfect palliation. Such cases afford a fruitful field for the practices of those unprincipled quacks who thrive on the foolish credulity of the

upper or affluent classes of society, which leads to intrusting the charge of life and health, not through careful inquiry into professional character, but by blindly following the fashion of the day. These persons constantly impress upon the patient that removal of the local disease would be attended with "the utmost danger;" and so it would,—but to no other interest than that of their own pockets. In the whole course of my practice I never met with an unfavorable result, either immediate or remote, from the operation, when properly performed; and I therefore feel no hesitation in recommending the method of treatment which has been explained, as no less safe than perfectly effectual.

It is in this form of the disease that the various plans of treatment for removing *prolapsus ani* by operation proposed by Hey of Leeds, Dupuytren, etc., have been applied. The essential part of all these procedures consists in removing, or otherwise destroying, a portion of the relaxed integuments which surround the anus. In some cases this may prove sufficient, but it is always attended with the double risk of affording only partial relief, and of causing a painful attack of inflammation in the morbid texture allowed to remain; while complete removal of the whole diseased part, as I have advised, by the combined employment of ligature and scissors, while hardly more severe at the time, effectually precludes the occurrence of painful consequences, and the danger of relapse.

PROLAPSUS FROM IRRITATION.

This form of the disease is nearly confined to the period of infancy and childhood. It is not limited in extent to a small part of the gut, but affects so large a portion of it as to occasion a complete invagination of the bowel, and to establish a similar condition to that which, taking place within the abdomen, is named Intus-Susception. The tumor that appears externally varies in size, but generally resembles an egg or small orange, though sometimes cylindrical in its form.

The descent is usually excited by straining at stool, or vehement crying; and these causes are, for the most part, called into action by some influence of an irritating nature, such as a stone in the bladder, teething, intestinal worms, or chronic inflammation of the mucous membrane of the bowels.

The treatment of prolapsus resolves itself into the means required for replacing the intestine, and those employed for preventing a return of the complaint. In order to attain the first of these objects, the patient should be laid horizontally on his side or back, with the limbs

bent on the pelvis, and desired not to hold his breath, which, by compressing the abdominal viscera, opposes the ascent of the gut. The surgeon then grasps the tumor, having previously lubricated its surface with oil, and gently but steadily compressing its neck with his fingers, while at the same time he urges on the body of the swelling, gradually pushes the protruded parts within the sphincter. In most cases this reduction is easily accomplished. But when it has existed for several days or longer, the coats of the bowel become so much thickened and painful that the manipulation requires to be conducted with great care and patience. A compress and T-bandage will be proper, should the protruding tendency continue in operation.

The prevention of relapse may be accomplished variously, according to the circumstances of the case. If local irritation be the exciting cause, it must of course be removed; and for this purpose different means will be required, according to its seat and nature. If the source of disturbance is a stone in the bladder, it must be cut out; if ascarides in the rectum, they must be expelled by proper medicines; if dentition, the gum must be scarified and the ordinary soothing means employed; if an unhealthy state of the mucous membrane, astringents, anodynes, and gentle stimulants of a proper secreting action, together with regulation of diet and regimen, will be necessary. While attempts are thus made to withdraw the source of irritation, the patient should be prevented, as far as possible, from voluntary straining, which is apt to continue through habit. With this view, the bowels ought not to be evacuated in the crouching posture usually assumed by children in doing so, as it renders the pressure of the diaphragm most direct upon the contents of the pelvis; and the patient should sit upon a chair so high as may prevent his feet from reaching the ground, to keep the trunk erect and moderate the force of the expulsive efforts. Care also should be taken to prevent him from sitting too long or too frequently at stool.

PROLAPSUS FROM WEAKNESS.

The protrusion lastly to be considered is nearly confined to old people, especially of the female sex, but may occur at any period of life. It depends upon want of retaining power in the sphincter; and this may proceed from general debility, affections of the nervous system producing paralysis, or a deficiency of strength in the muscle itself. The tumor is usually of a large size, and if it has been permitted to remain long unreduced, so that the coats of the bowel become thickened and unyielding, considerable difficulty may be experienced in the

replacement. After this has been accomplished, through the means mentioned above, the patient should remain in the horizontal posture, with a compress and T-bandage carefully applied to prevent removal of the dressings. In other respects the treatment must be varied according to the circumstances of particular cases, with the view of removing or lessening the want of resistance, on whatever it depends; and if relief cannot be obtained in this way, the mechanical support of a bandage may perhaps prove useful.

There is a rare and curious form of this disease which requires to be carefully recognized in practice, as it is apt to appear of an incurable kind, while really very easily remediable; the sphincter, though relaxed and weakened by overdistention, still admitting of a return to healthy action when the obstacle to it is removed. In this case the patient is usually an adult, and the tumor of a large globular or oval form, sometimes invested with a cuticular covering in consequence of its exposure from long and frequent protrusion. The remedy consists in replacing the bowel within the sphincter, and then cutting away the loose redundant skin which surrounds the anus in pendulous folds. Each fold should be seized by forceps and removed by scissors, directed from the circumference to the center of the aperture. The patient is kept in bed for a week or two, and not allowed to evacuate his bowels except in the horizontal posture until the wounds are soundly healed. By proceeding in this way, I have effected complete and permanent relief in cases of the most hopeless character.

CHAPTER IV.

POLYPUS OF THE RECTUM.

The rectum is sometimes, though very rarely, the seat of morbid growths from the mucous membrane, to which the title of polypus has been applied, rather on account of their form and origin than from similarity of texture to the growths so designated in other parts of the body. The extreme rarity of this disease may be estimated from the statement of Sir A. Cooper, that in the whole course of his experience he met with only ten cases of it.* He says that it generally

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* Surgical Lectures.

occurs in children, and very rarely in adults, and that the most advanced age at which he has met with it was twenty-two. Most of the cases that have fallen under my own observation were in persons who had attained or passed the middle period of life. In five, which, by a curious coincidence, came under my care in the course of little more than a fortnight, two were in adults and three in children.

The disease presents itself in three different forms, of which one usually occurs in childhood, and does not appear much beyond puberty. A gentleman now established in practice not far from Edinburgh, when attending my lectures,—then I suppose about 18 or 19 years of age,—applied to me for the removal of a polypus, such as is met with in early life; but with this exception, I never met with it beyond the 9th or 10th year. It is extremely soft and vascular, of a florid red color, and assumes the form either of a worm from two to four inches in length, or of a strawberry with a connecting foot-stalk two or three inches long. This tumor seldom protrudes except when the bowels are evacuated, and then admits of ready replacement, though not without occasional and considerable hemorrhage. The vascularity of this growth, and its attachment above the sphincter, made me averse from removing it by excision; and Sir A. Cooper has mentioned the alarm that was on one occasion excited in his practice by doing so. I have always employed the ligature; and though the soft texture readily gives way when the thread is drawn, bleeding has never occurred in a single instance, nor has any other symptom in the least degree disagreeable resulted from this mode of removal; I am therefore induced to regard it as the best that can be employed.

In adults the disease appears in two very distinct forms. In one of these, the growth is soft, vascular, prone to bleed, lobulated or shreddy, and malignant looking, but possesses a peduncle or foot-stalk, sometimes capable of sound cicatrization after being divided. The profuse, frequent, and protracted bleeding which proceeds from this sort of growth, renders its removal an object of great consequence; and this may be effected very easily, with perfect safety, by transfixing the radical cord of connection with a double ligature, tying the threads so as to include a half of it in each, and then cutting it across a little below the constricted part. In a patient of Mr. Craig of Ratho, who detected the disease from the great hemorrhage it occasioned, I could not accomplish protrusion of the tumor, but guided a ligature on my finger, and tied it on the neck within the rectum. It is more satisfactory to force or draw the swelling beyond the sphincter, so that the sound and morbid parts may be distinguished with certainty, and this can usually be done with great facility, although the growth has at-

tained a large size. In a hospital case recommended by Mr. Anderson of Castle-Douglas, I brought into view and removed a tumor not less than an orange in size, which had a most malignant aspect, and had nearly exhausted the patient by hemorrhage.

In the other form which polypus of the rectum assumes in adults, the tumor is of a firmer consistence, smoother surface, and more regularly spherical or oval form. The symptoms resulting from this simple swelling are rather annoying than seriously alarming; and the patient, therefore, is apt to delay requiring assistance for a long while. In the case of an old lady, whom I saw with Mr. Hilson of Jedburgh, the tumor was about the size of a cherry, with a long stalk, and we were assured had protruded every time the bowels moved for twenty years. In another case, a gentleman whom I saw with Dr. Johnston of Cumnock, the tumor was nearly as large as an egg, had a cuticular covering, and appeared to have existed for a period equally long. I have always removed these growths in the way that has been already described, and never met with the slightest consequence of a disagreeable kind.

While this sheet is passing through the press, I have under my care a patient who came from the country on account of *fistula in ano*, which had been twice cut, under the impression that it did not communicate with the gut. Having found an internal opening in the usual situation, I divided the septum, and filled the cavity with lint. Upon visiting the patient a few days afterward, I was surprised to see a lobulated tumor nearly the size of a pullet's egg protruding from the wound, and then learnt that for twelve or thirteen years there had been occasionally a partial protrusion of this swelling, but not to the full extent which had resulted from the additional freedom afforded by the incision. Ligatures were immediately applied, and the patient now seems to be completely relieved from his complaint.

CHAPTER V.

STRICTURE OF THE RECTUM.

THE rectum, like the œsophagus, which it resembles in many points of structure, function, and morbid derangement, is liable to stricture of two different kinds. In one of these there is merely contraction of the coats, with thickening and induration of their texture. But in the other there exists a morbid growth, attended with the symptoms, and prone to the changes, which characterize malignant degenerations of structure. Want of attention to this very obvious and necessary distinction has led to great misapprehension in regard to the nature of the disease, and serious errors of practice in its treatment. By some it has been looked upon as always admitting of remedy at an early stage, and by others it has been considered always incurable; while the good effect of introducing bougies in cases of the simple or non-malignant kind, has encouraged those who supposed the stricture to be constantly of a carcinomatous nature to expect benefit from the employment of pressure in the treatment of cancer occurring in other parts of the body.

SIMPLE STRICTURE OF THE RECTUM.

The simple stricture is seated very near the lower extremity of the rectum, a little within the sphincter, about two inches or rather more from the anus. It is here that the gut changes the direction of its course, and after following the curvature of the sacrum makes a sudden turn outward to its termination. There is thus formed a sort of angular projection by the posterior surface of the bowel, which may be supposed likely to increase when subjected to continued irritation of any kind, and at length to constitute an inconvenient degree of contraction. It has been maintained that this is not the sole seat of stricture in the rectum, and that the disease frequently occurs farther up the canal, especially at the distance of five or six inches from the anus. Indeed, some have gone so far as to profess their ability not only to recognize, but to treat it successfully, when seated beyond the rectum altogether, in the sigmoid flexure of the colon. That contractions of the great

intestine may occur in any part of its course, I do not mean to question. But that the thickening and induration of its coats are in such cases usually confined to the narrow limits which constitute a stricture in the ordinary acceptation of this term, or that the strictured part when so situated can never be accurately ascertained and efficiently dilated by the use of instruments, I have no hesitation in expressing my unqualified disbelief.

It is very natural for persons suffering from constipation to suppose that obstruction of the bowel is the cause of their complaint; and they are consequently ready to believe in the existence of stricture when it is intimated to them by their medical attendant, especially if, at the same time, hopes of relief are held out from the employment of mechanical treatment by dilatation. There is too much reason to fear that unprincipled practitioners have taken advantage of this facility in the disposition of their patients to promote their own unworthy views. But I should be sorry to allege, that either the supposed discovery or the treatment of strictures high up the rectum necessarily implied a want of good faith, since the practitioner is hardly less exposed to deception than the patient; and if he examine the rectum, under an impression that there is a stricture existing in it, he will be very apt to believe that he has found one. In the feeble and unhealthy persons who are usually suspected to labor under the disease, the coats of the rectum are so thin and relaxed as readily to catch the point of the bougie employed for exploring the cavity, and thus impede its progress, which is also apt to be arrested by the promontory of the sacrum. As an instance of this, I may mention the case of an elderly lady whom I saw with Dr. Begbie. She had been supposed to suffer from stricture of the rectum, between five and six inches up the gut, and had been subjected to treatment for it during several years before coming under Dr. Begbie's care, by two gentlemen of the highest respectability in this city. Finding that the coats of the rectum, though greatly dilated, were quite smooth, and apparently sound in their texture, so far as my finger could reach, and conceiving that the symptoms of the case denoted a want of tone or proper action, rather than mechanical obstruction of the bowels, I expressed a decided opinion that there was no stricture in existence. Not many months afterward the patient died; and when the body was opened not the slightest trace of contraction could be discovered in the rectum, or any other part of the intestinal canal. One of the gentlemen who had been formerly in attendance was present at this examination; and wishing to know what had occasioned the deception,—which he said had led to more than *three hundred hours* being spent by himself and his col-

league in endeavors to dilate the supposed stricture with bougies,—he introduced one as he had been wont to do, and found that, upon arriving at the depth it used to reach, its point rested on the promontory of the sacrum. Other cases might be mentioned to illustrate the uncertainty of information as to the capacity of the higher part of the rectum, obtained by exploring the gut, and to show how far the best-intentioned practitioners may be misled by the sources of fallacy I have endeavored to explain.

If the symptoms of stricture of the rectum could be traced at an early stage of the disease, difficulty in evacuating the contents of the bowels would probably be their most remarkable feature. But the complaint almost always steals on insensibly, so as not to attract attention until fully formed; and then the inconveniences experienced are so different from what might be expected, that they tend rather to obscure than to indicate the nature of the complaint, which is therefore seldom suspected by the patient. There was in the hospital here a woman admitted on account of a *fistula in ano*, in whom, on introducing my finger into the rectum, to guide the knife in dividing the septum, I found a stricture in the ordinary position, so tight as to exclude anything larger than a moderate-sized urethra bougie; yet she had been quite unconscious of its presence, though the symptoms proceeding from it were extremely severe. The reason of this is, that the effects of a confirmed stricture are in general the frequent, often almost incessant, discharge of thin feculent matters, owing to the copious secretion of mucus which results from the irritation of the disease; and that the thin slimy stools, occasionally tinged with blood, attracting more notice than the small indurated masses of feces passed along with them, make the case assume the appearance of diarrhœa. The mistake thus committed not only prevents the proper means of remedy from being employed, but leads to the administration of astringents and anodynes, which must prove hurtful by checking the process instituted by the system for its own relief. This consists in the copious secretion of fluids into the cavity of the great intestine, which lessens the solidity of the feculent matters and facilitates their passage through the narrow channel remaining for their escape. Being forced down upon the stricture by the violent efforts to unload the distended bowels, a small quantity is urged through the stricture, and issues from the anus in a sudden jet, as if propelled by a squirt. The chief character of the disease in its advanced stage, then, is the frequent squirting out of thin feculent matters, containing no solid masses, or only very small ones, and mixed with blood or mucus, accompanied by a sensation of cutting or burning in the rectum. In addition to

this the abdomen is distended, partly by retention of its feculent contents, partly by tympanitic swelling, caused by derangement of the bowels. Pain also is felt in the sacrum, extending down the limbs; and abscesses frequently form in the vicinity, so as to lay the foundation of *fistula in ano*. In this case the sinus does not, as has been alleged, open into the gut above the contracted part, but holds its usual position near the anus, and should be regarded rather as an accidental consequence of the neighboring irritation than as a direct effect of the stricture.

The disease is met with more frequently in females than males, and generally occurs about the middle period of life. It is extremely distressing, and if not remedied may at length prove fatal, by gradually exhausting the patient's strength, or exciting inflammation of the bowels. Some years ago I attended a gentleman for *fistula in ano* together with stricture of the rectum. Not long afterward he told me that his wife complained of symptoms similar to those he had suffered from the latter ailment. I proposed an examination of the rectum, which was declined, and I heard no more of the patient, until raised one night by an urgent request to visit her immediately. She was laboring under the symptoms of peritonitis in its advanced stage, and died before the end of many hours. The rectum was contracted almost to obliteration at the usual part. Instead of terminating thus abruptly and violently, the disease more frequently, when it proves fatal, gradually exhausts the strength of the patient, by the continued uneasiness and derangement of the digestive functions which attend it. Extreme emaciation and hectic irritation are thus induced; and unless some other disorder occurs to arrest his sufferings, he at length sinks under the complaint. The progress of such cases is by no means rapid; and the disease after attaining a certain extent often seems to remain stationary; so that there is usually ample opportunity for its discovery and treatment.

From the slow and insidious formation of stricture in the rectum, it is not easy to ascertain the circumstances which give rise to it. The analogy of what happens in other mucous canals would lead to the supposition that continued irritation of the gut is probably the immediate exciting cause. But the precise way in which this state is occasioned, or why, when its other effects are so common, it should so rarely produce the effect in question, are points that have not yet been satisfactorily made out.

In the treatment of the disease some temporary relief may be derived from injecting tepid water or oil into the rectum, to soothe the irritation of its coats and facilitate the discharge of its contents. But as

the patient cannot be freed from his complaint by such means as these, it is necessary to inquire how the gut may be restored to its natural capacity. Of the means employed to remedy strictures of mucous canals in general, namely, the caustic, the knife, and the bougie, the two last mentioned have alone been resorted to in treating stricture of the rectum. Division of the contracted part with a cutting instrument, notwithstanding the obvious risk of hemorrhage and inflammation incurred by doing so, has been occasionally practiced; and with such speedy as well as complete relief, that some practical writers regard this method as the one which ought to be preferred. But experience having ascertained that, in certain conditions of a constitutional and local kind, wounds of the rectum, even though of very small extent, are followed by serious or fatal consequences; and as the bougie, though not so speedy in its operation as the knife, being in general equally effectual, and not exposed to the same objection, prudence seems to require that the practice of incision should be either entirely abandoned, or only used in particular cases with extreme caution. The best instrument for the purpose is the blunt-pointed curved bistoury; and the stricture should be either divided backward, in the direction of the sacrum, or notched at different parts of its circumference by cuts of smaller extent. A young lady was brought here in a state of great exhaustion from the severe and protracted suffering caused by stricture of the rectum. It had been dilated by bougies without any relief, and when I saw her, had contracted to the size of a quill. Large quantities of mucus were discharged—and a fistulous communication with the vagina had recently taken place. In these circumstances I considered myself warranted to employ incision, and did so with the effect of completely removing the local complaint and restoring the general health.

The use of bougies in removing strictures is a remarkable example of good practice originating from false principles. It was at first adopted with the view of destroying obstructions of the urethra through the effect of medicinal substances, which were in this way applied to the contracted part of the canal. And when experience had proved that bougies of the simplest composition, as those constructed of metallic substances, were not less effectual than those of the medicated kind, the process of improvement was next ascribed to the dilatation acting merely mechanically as on a tube of dead matter. Hence it was thought impossible to introduce the instruments too frequently or for too great a length of time. At least once a day was thought essential; and they were permitted to remain for hours at a time. But the contracted canal is not composed of dead substance,

and the stricture depends upon a peculiar morbid action of the living texture. The beneficial effect of the bougie, therefore, must consist in the excitement of another action opposed to the one formerly in operation, and capable of restoring the gut to its natural state.

It is the effusion of organizable matter into the cellular texture of the part that causes the stricture, and it is the absorption of this deposit which removes the disease. The bougie by effecting pressure excites the action of absorption. And if the pressure be too great, too long continued, or too frequently repeated, there will be a risk of causing more than sufficient irritation for the purpose, and of inducing again the very condition it is employed to counteract, the consequences of which must be a confirmation and increase of the disease. The perfection of treatment by means of the bougie may thus be considered to consist in using it merely to the extent requisite for producing its beneficial effects; and this is now fully ascertained to be much less than might at first view have appeared possible. Instead of requiring to be introduced daily, and to remain in the passage for hours, it appears that the bougie causes a sufficient degree of excitement if used every third or fourth day, and withdrawn immediately after being passed through the stricture. Under this system the improvement not only advances at least as quickly as when the operation is performed more frequently, but it is likewise much more sure in its progress, and much less apt to be interrupted by an undue irritation of the part concerned. These principles now regulate the treatment of stricture in all the mucous canals which are subject to it, namely, the urethra, œsophagus, and rectum.

Rectum bougies are constructed of various materials; and from the facility of guiding them through the stricture, owing to its position in the vicinity of the anus, the composition of the instrument is of less consequence than when the disease is seated in the urethra or œsophagus. Metals, wood, glass, and cloth made up with plaster or elastic gum may be employed. But, on the whole, those formed of iron and elastic gum are the most convenient. The former are cheap and imperishable, the latter are more expensive and liable to decay, but perhaps more easily introduced and less hurtful to the feelings of the patient.

When the operation is to be performed the patient should be placed upon his side, and then the surgeon, having in the first place satisfied himself as to the precise condition of the stricture, by feeling it with his finger, passes a bougie lubricated with oil or lard up to the obstruction, and presses against it steadily but gently. If the resistance cannot be overcome without using force or causing pain, he withdraws

the bougie and tries a smaller one in the same way, thus proceeding until he gets one to pass through the contraction, immediately after which he withdraws it, and concludes the process for that time. If necessary some soothing means, such as an opiate injection, or the hip-bath, may be employed to allay any undue irritation that has been excited even by this cautious proceeding. At the end of three or four days, or a longer interval if the patient continues to suffer from the former operation, the bougie which was introduced upon that occasion is again passed, and followed up by another of larger size, and thus the treatment is carried on until the disease ceases to occasion any inconvenience, and a full-sized bougie can be introduced with ease.

MALIGNANT STRICTURE OF THE RECTUM.

There has been some difference of opinion as to the comparative frequency of simple and malignant stricture of the rectum; but from my own observation, I should say that the latter is, out of all proportion, more often met with than the former. It generally occurs in the same part of the gut as the simple stricture, but is not so limited or regular in its extent. The diseased growth is sometimes confined to one side of the gut, at others it affects the whole circumference; and it is only in the latter case that there is stricture properly speaking, though it is usual to designate by this title all morbid growths occurring in the coats of the rectum. The swelling is usually of a very irregular form, and seldom extends less than several inches along the gut. Occasionally it descends quite to the anus, or even shows itself externally, so as to simulate a pile, for which I have often known it mistaken and treated; but more frequently it leaves the coats of the intestine free for an inch or two within the sphincter. The morbid growth generally possesses a moderate degree of firmness, and exhibits characters intermediate between those of carcinoma and medullary sarcoma. It encroaches on the cavity of the rectum so as to impede more or less the evacuation of the bowels, and being attended with the symptoms which are wont to proceed from degenerations of a malignant kind, occasions great and almost unceasing distress. The patient complains of a shooting or fixed dull pain in the back, at the upper part of the sacrum, and extending down the limbs, together with a sense of weight and uneasiness in the part affected, especially after evacuation of the bowels, or the operation of any circumstances causing irritation of the disease. He passes blood and purulent matter along with his stools, which are thin and frequent; and though in the early stage of the disease difficulty may be experienced in passing them

through the thickened coats of the gut, there is for the most part ultimately rather an inability of retention, from the action of the sphincter being impeded by the progress of the disease. His countenance displays the greenish-yellow complexion characteristic of malignant disposition in the system, and he loses flesh as well as strength. On examination the gut is found not only contracted, but thickened and irregular on the surface. The coats at the affected part are hard and unyielding, and the morbid growth is felt projecting into the cavity, sometimes in the form of rounded tubercles, at others rough with ulcerated depressions. As these changes, judging from touch alone, may not differ except in degree from those which attend the simple stricture, it would sometimes be difficult to determine the nature of the complaint merely by local examination. But the symptoms which accompany it are so well marked that the disease can hardly be either overlooked or mistaken. In its progress the patient becomes generally exhausted, and falls into a hectic state, which is soon followed by dissolution.

In common with other malignant affections, carcinomatous stricture of the rectum does not admit of being remedied by any kind of treatment directed with the view of restoring the diseased part to its natural state; and its situation forbids any prospect of benefit from removal by the knife or other means.

In these circumstances, palliation is all that can be reasonably attempted; and for this purpose opiate injections with the hip-bath are very useful. The patient should be enjoined to abstain from every kind of stimulating food and drink, and also to avoid any exertion of body likely to aggravate the complaint, resting as much as possible in the horizontal posture. The introduction of bougies and all other operations not only can do no good, but must ever produce an injurious effect, by increasing the irritation of the disease and accelerating its progress. It appears that a considerable portion of the rectum, even to the extent of a couple of inches, may be cut out without any very serious bad consequences in the first instance. But the patient can experience no benefit from this being done, and, in addition to the pain of the operation, must have an impulse given to the morbid action; so that if there are any cases in which this excision of the rectum has been followed by a permanent cure, the disease could not have been of a malignant nature. It may seem unlikely that so severe a proceeding should ever be resorted to except in cases the most hopelessly incurable by other means. But, so far from this, however startling and incredible it may appear, the fact is, that removal of the extremity of the rectum has been taught and practiced as the best

mode of treating those hemorrhoidal affections which are generally comprehended under the title of *prolapsus ani.* That a complaint which, as has been shown above, may be certainly remedied with little pain, no danger, and without any injury to the natural structure, should be thought to require an operation so dreadful in its performance and effects as cutting out the end of the bowel, together with its sphincter, is to be deeply regretted, as well for the credit of surgery as the good of humanity. It is needless to say that, after this extirpation has been performed, the healing of the wound is attended with an extreme contraction, I have heard even obliteration of the gut; and the patient must consequently, like the victims of the ancient operation for fistula, suffer from the united miseries of constipation and incontinence.

It is possible that cancer may occur at the verge of the anus, as it does in the somewhat similar texture of the lip, and then excision may be practiced without any impropriety. But cases of this kind are extremely rare, and should be carefully distinguished from those in which the coats of the bowel are implicated, where the knife can never be prudently or beneficially applied.

CHAPTER VI.

FISSURE OF THE ANUS.

THERE is probably no disease of the human body that gives rise to so much uneasiness in proportion to its extent, or admits of remedy with so much certainty and upon terms so easy, as the one now to be considered. Although well described nearly half a century ago by the distinguished French surgeon, M. Boyer, it has only of late years attracted much notice in this country; and is still by no means so familiarly known, either as to its diagnosis or treatment, as might be desired.

The disease is usually met with in people between twenty and fifty years of age. It consists of a small ulcer, scarcely exceeding half an inch in length and about a line in breadth, seated between the folds of the skin which surrounds the orifice of the rectum. The morbid surface being of such limited extent, and lurking so deeply, cannot be brought into view except by expanding the anus. In ordinary cir-

cumstances this may be done without any difficulty, but when a fissure exists, it is impeded by two very embarrassing obstacles. For, in the first place, the superficial fibers of the sphincter are strongly contracted by the irritation of the ulcer, so that the orifice, instead of presenting a conical hollow, appears like a minute perforation on a flat surface; and secondly, there is generally a small firm red-colored pile, like a pea in size and form, at the base or outward extremity of the fissure, which tends not only to conceal the sore, but to render its exposure more painful. To a practiced eye, indeed, the peculiar form, consistence, and color of this little swelling render it a good guide to the seat of annoyance; but it much more frequently misleads to the idea that there is no local complaint, or only an external hemorrhoid. In some rare cases the ulcer is seated altogether within the sphincter, and then can be recognized only by means of a speculum or experienced finger, which detects it by the same sort of sensation that is experienced by pressing upon a button-hole, from the base and margin being always thickened and indurated, so as to render the sore distinctly perceptible notwithstanding the small extent of its surface.

In both of these situations the disease gives rise to nearly the same symptoms. There is always acute sensibility of pressure, which renders every attempt at examination extremely painful,—in irritable persons causing an approach to syncope or convulsion, and upon all occasions eliciting expressions of intense suffering. Evacuation of the bowels is attended with pain, generally not so severe at the time as a short while afterward, when it becomes very distressing and acute for half an hour or more. There is frequently a discharge of blood and mucus along with the feculent matter, but not in any large quantity. Sitting is painful, and the patient may be noticed to rest with one hip on the corner of his chair, so as to protect the anus from pressure. Uneasy sensations are often experienced at a distance from the part affected; especially shooting down the limbs, so as to simulate sciatica or rheumatism, and causing symptoms of urinary irritation so strongly marked as to remove all suspicion of the rectum being the seat of disturbance. In many of the cases that have fallen within my observation the disease had thus escaped detection; and I have met with patients who, during a long course of years, had sought in vain for relief throughout the great cities of Europe—being treated for irritation of the bladder or urethra, while their complaint depended upon fissure of the anus, or ulcer of the rectum. There are few occasions on which the exercise of surgical art is more satisfactory than the instantaneous and complete remedy of such cases by the simple and gentle means immediately to be mentioned.

The causes concerned in the production of fissure are very obscure. It seems most probable that some accidental laceration or abrasion of the lining membrane lays a foundation for the disease; and that such may be the mode of production is proved by the occurrence, very rare, it is true, of fissures presenting the most characteristic features after operations for the removal of hemorrhoids. But whether a mechanical lesion be essential as an exciting cause, or is only partially and occasionally concerned in their establishment, remains to be ascertained.

In the treatment of fissure all sorts of applications, whether soothing or irritating, have been found unavailing, and from Boyer downward it has been a settled principle that incision affords the only effectual remedy. But the extent of incision really requisite is very different from that formerly recommended. Boyer, supposing that the spasmodic contraction of the sphincter was the obstacle to recovery, considered complete division of the muscle necessary. After suitable preparation of the patient he guided a straight bistoury upon his finger into the rectum, and then cut through "the coats of the intestine, the sphincter, cellular texture, and integuments." The wound was stuffed, and not dressed again for several days. It healed, he says, generally by the end of a month or six weeks, but sometimes required two or three months before cicatrization was perfectly effected. Instead of this very severe procedure, I am warranted by ample experience to state that it is sufficient to cut through the fissure in its long direction, and as the ulcer does not affect any other texture than the mucous membrane, thus limit the incision to this membrane. The best instrument for this purpose is a sharp-pointed curved bistoury, and the most certain mode of employing it to attain the object in view, without cutting more than enough, is to transfix beyond the base of the ulcer, so as to cut through it inward upon the finger previously introduced as a guide. This little operation is neither difficult nor painful. It does not cause the loss of more than a few drops of blood, and the wound, as it requires no dressing, heals in the course of a few days.

CHAPTER VII.

SPASMODIC STRICTURE OF THE ANUS.

THE derangement known under this title, which is perhaps not very correctly applied, consists in a permanently contracted state of the sphincter, or rather the external part of this muscle which lies immediately below the integuments. The skin surrounding the orifice is in consequence so drawn together that, as I have mentioned with regard to the condition connected with the presence of a fissure, there is no longer the conical hollow usually perceptible as a sort of vestibule leading to the bowel, when the nates are held aside; but in its stead a flat surface, having in the center a small perforation, of which the lip is firmly closed. If the finger by gentle efforts be gradually insinuated through the anus thus altered, it feels a strong compression in the seat of the external sphincter, as if inclosed in a ring of India-rubber on the stretch—and in addition to this permanent force an occasional increase of tightness from spasmodic action of the muscle, the patient at the same time complaining of excessive pain.

If the contraction exists, as it generally does, along with fissure of the anus, it aggravates the symptoms of that complaint by causing pressure on the ulcerated surface. But, though not thus complicated generally, it gives rise to nearly the same symptoms, and as the disease is still more apt to escape detection when it exists in this simple form, the amount of misery, admitting of easy and effectual relief, that is endured, especially by patients of the female sex, could hardly be imagined by any one not practically acquainted with the subject. There is also occasionally much difficulty experienced in effecting evacuation of the bowels, which, when felt by the patient as if about to be accomplished, is all at once prevented by an insuperable resistance. By means of injections into the rectum, if they can be introduced, which is not always the case, and the use of medicines that produce watery stools, some degree of benefit may be obtained, but there is of course no complete relief so long as the constriction remains.

This contracted state of the sphincter is so generally associated with fissure of the anus, that it has usually been regarded either as the same or an effect of that disease. The latter of these views seems the

more reasonable of the two, and agrees with the important fact, that when the morbid conditions in question exist together, curing the fissure often relieves the stricture. But the muscular contraction is not unfrequently met with independently of any other ailment, and must therefore admit of being established without the influence of local irritation. After the operation for hemorrhoids, spasmodic stricture sometimes occurs in its most perfect form, even when there has been formerly very large protrusions, and apparently an almost complete want of muscular power, and it is therefore necessary to beware of treating with inattention any complaints suggesting such a change having taken place, however unlikely it may seem to be.

Dilatation of the contracted sphincter is extremely painful, and if carried on by the persevering use of bougies or other means, does not afford the slightest relief; as the muscular ring, however much expanded when freed from the distending influence, immediately resumes its former straightness. While the ordinary treatment of stricture proves thus inefficient, it is fortunate that another mode of proceeding affords instant and complete relief. This consists in dividing the contracted fibers of the muscle, which may be done most easily by introducing a bistoury beyond the contracted ring until it reaches the finger placed within the anus, and then withdrawing the blade through the orifice. The incision requires to be of very moderate extent, hardly exceeding an inch either externally or internally, and should be made at one side, toward the tuberosity of the ischium. A piece of dry lint may be inserted between the edges of the wound to prevent bleeding, and then any simple dressing applied to the surface will be sufficient until cicatrization is completed. A bistoury introduced upon the point of the finger, and carried outward to a sufficient distance, will also attain the object in view, but not so conveniently and certainly.

ON

STRICTURE OF THE URETHRA

AND

FISTULA IN PERINEO.

PREFACE TO THE FIRST EDITION.

When attention has been long devoted to the attainment of an important object, and when the most elaborate efforts have proved ineffectual for the purpose, it is not easy to persuade those engaged in the pursuit, that they have overlooked a simple and easy mode of obtaining success. The method of treating obstinate strictures of the urethra, recommended in the following pages, was communicated to the profession five years ago, through the periodical press; and again, two years ago, in a collection of surgical essays; but, so far as I know, it has not yet been adopted by others even in a single instance. Being deeply impressed with the importance of the subject, I feel it my duty to make another attempt, with the view of awakening attention to it, by publishing in a separate form full details of the procedure, together with its advantages, positive and comparative, and also further evidence of its efficacy, from cases in public as well as in private practice. Having done this, I leave the matter to the profession, trusting that, whatever may be their decision, they will at least give me credit for an earnest desire to render the opportunities committed to me conducive to the improvement of Practical Surgery.

Edinburgh, 1st *November*, 1849.

STRICTURE OF THE URETHRA.

THERE are few human infirmities productive of more distress and danger than stricture of the urethra, when it assumes an aggravated form. The painful, laborious, and frequently repeated efforts to effect micturition, occupying the patient's time by day and disturbing his rest at night—the liability to complete retention of urine, with all the risks of abortive attempts to introduce catheters, or the more desperate resource of puncturing the bladder—the involuntary dribbling of water, wetting the clothes and excoriating the person—the feverish attacks—the abscesses, and the fistulas of the perineum—the inability for exertion, whether of body or mind—the irritability, despondency, and emaciation, with the despair of relief except from premature death, constitute a sad catalogue, which might be greatly extended without comprehending all the evils originating from this fruitful source of misery.

With reference to their symptoms and treatment, strictures may be divided into—1. Imaginary; 2. Slight; 3. Confirmed; 4. Irritable; and 5. Contractile.

Imaginary strictures constitute a large proportion of the cases that occur in practice. They generally depend upon an erroneous idea of the patient, suggested by some irritation of the urinary organs, or debility in the expulsive power of the bladder, and encouraged either through unskillfulness of the surgeon, who attributes the pain and difficulty resulting from his awkward use of instruments to contraction of the passage, or through the culpable delusions of rapacious quacks whose appropriate field is the remedy of diseases that have no real existence. Such cases explain the good effects attributed to various modes of treatment, which, if the stricture were real, would prove useless, impracticable, or injurious.

Where a stricture does exist, but in no great degree of duration or contraction, it may be easily removed by dilatation through the use of various means, such as retaining a succession of catheters in the

bladder, or introducing bougies frequently for lengthened periods. There is, however, no occasion to place the patient under any such restraint, since the object in view may be more simply, safely, and effectually accomplished by passing bougies with intervals of three or four days, and withdrawing them immediately after their introduction. One or two of the steps in the scale being thus gained each time, the urethra is soon expanded to its natural capacity, without pain, trouble, or confinement.

It is a remarkable fact that strictures frequently pass into the most confirmed state without the patient being aware of their existence. The symptoms steal on so slowly and insidiously, that the flow of urine may be reduced to a thread-like stream little better than a succession of drops, while no suspicion is excited, until an attack of complete retention, or the length of time occupied in evacuating the bladder, leads to an examination of the passage. Not unfrequently the first intimation of there being something wrong is afforded by the formation of a perineal abscess; and as the explanation usually given to account for this occurrence is not at all correct, the true nature of the process may be here considered.

The ideas which have long been and still are prevalent in regard to perineal abscess and fistula afford an example of probabilities in pathology being assumed as trustworthy instead of the facts ascertained by observation. It is said that the urine, impeded by the stricture, presses upon the urethra behind it, and thus causes ulcerative absorption, which forms an opening in the canal that allows a little water to escape into the cellular texture, where it lays the foundation of an abscess. Now, if this explanation were correct, the early history of such collections of matter would always present the symptoms of that violent local and general disturbance which is attendant upon urinary extravasation. But so far from this being the case, the perineal abscess usually forms slowly and insidiously; and when opened by incision previous to its spontaneous evacuation, is found to contain purulent matter alone, unmixed with urine. It is true, that if an external drain be not afforded, the fluid may discharge itself into the urethra, and then indeed the urine, not only entering the cavity, but being urged into it by the contractile force of the bladder, while the stricture opposes its outward flow, breaks down the circumscribing wall of lymph, and diffuses itself through the scrotum, when an opportunity is presented of seeing what would happen if, in accordance with the generally received opinion, its escape were, in the first instance, permitted directly by ulceration of the urethra.

The truth seems to be, that the irritation of the stricture, or of the

means employed for its remedy, occasions inflammation in the textures adjacent to the urethra, which, sooner or later leading to suppuration, gives rise to an abscess separated from the canal of the urethra merely by its lining membrane, but thickly covered externally by the fascia and integuments of the perineum. In obedience to the law of progressive absorption induced by the pressure of purulent matter, spontaneous evacuation is nevertheless much more apt to take place outwardly than inwardly, although the resistance of the fascia tends to render the passage tortuous and directed toward the hip, scrotum, or anus, instead of the nearest point, which of course coincides with the raphe. In no long time after the matter is thus discharged, or through an incision anticipating this event, ulcerative absorption establishes an opening in the thin denuded portion of mucous membrane that constituted the urethral wall of the abscess, and then the urine escaping in more or less quantity, renders the fistula in perineo complete.

When an instrument of any sort can be passed through a stricture, it is generally possible, by careful and well-directed efforts, to introduce a succession of larger ones, so as to dilate the contracted portion of the canal to its natural capacity. The process thus accomplished has been naturally, but perhaps rather unfortunately, named Dilatation; since this title conveys the idea of a purely mechanical effect, and has doubtless led to many of the plans for treatment which are founded upon the same principle and executed by similar means as those employed for stretching the finger of a glove. But it should be recollected that while the cause of stricture is effusion into and condensation of the urethral coat, relief is afforded by the opposite action of absorption, which restores the thickened texture to its proper condition, and that the beneficial effect of dilating means depends upon their exciting such a counteracting agency in the living tissue. Any sort of stretching which exceeds the degree requisite for this purpose, so far from doing good, will, therefore, probably increase the evil by reinducing the irritation productive of contraction; and mere distention of the canal, by the permanent retention of catheters, must not be confounded with the real widening which results from a restoration of the urethral coats to their natural state of capacity and tenuity.

To effect dilatation with this view, the best means are unquestionably metallic bougies, and those made of Berlin silver seem decidedly preferable to any others, as they take a fine polish, are not liable to rust, and, being hollow, are guided more lightly than the plated steel instruments used in London, while their moderate expense does not place them beyond the reach of ordinary employment. Ten sizes are

sufficient, unless in extraordinary cases, for dilating the tightest stricture to the natural width of the canal; beyond which there is no advantage in distending it. It is usual to pass bougies while the patient is in the erect posture. But whenever any difficulty is anticipated, he should be placed horizontally; since the operator can thus judge much better as to the direction of the urethra, which varies with the form of the pelvis, and can also conduct the manipulation altogether more gently. Pain and bleeding are certain indications of the procedure being faulty. The bougie should be rather suspended than held between the tips of the fore and middle fingers, and gently urged on by the thumb, while the fingers of the left hand rest on the perineum to assist in determining the proper course of the instrument. Stretching of the penis and forcible clutching of the bougie are sure signs of awkwardness and incompetency in this department of surgery; and a patient who has once had the instrument properly introduced, can always afterward distinguish between its proper and maladroit employment.

When the existence of a stricture is suspected, the urethra should be examined by introducing a moderate-sized bougie; such as No. 8. If one larger than this be employed, it may encounter resistance at the narrowest part of the channel, though there is no real contraction, while one of smaller size may not detect a degree of stricture requiring dilatation. But when a bougie of the size above mentioned is obstructed, there need be no doubt as to the existence of stricture, and its degree of tightness should next be ascertained by trying a succession of smaller instruments until one is passed. It is unnecessary to say anything as to the preposterous plan of taking casts of the stricture by pressing upon it the extremity of a soft plaster bougie, since any one at all conversant with the subject must be satisfied that such a procedure can produce no result better than deception of either the practitioner or the patient. The only satisfactory measure of a stricture is the instrument which it allows to pass; and this being ascertained, the dilatation may proceed from that point, according to the principle which has been explained. But however often the introduction of instruments may be required for this purpose, the greatest care should be taken to avoid all attempts to gain an advance by force in opposition to unfavorable circumstances. If the patient is heated or out of order—if he has exceeded in the use of stimulants, or proposes to do so—if he has performed a journey or is about to undertake one—if the urine is thick or loaded with mucus—if the bowels are constipated or unduly relaxed—if the urethra is inclined to bleed or appears more than usually irritable—if there is pain

of the testicles or perineum—and, finally, if the surgeon is in haste or out of humor, the operation ought to be delayed.

However carefully and skillfully this process may be conducted, disagreeable consequences are apt to result from it, and the risk of such occurrences will of course be greater when there is any impropriety on the part of either the patient or the surgeon. The most frequent are rigors, followed by heat and perspiration, so as to simulate attacks of ague, for which they are often mistaken, especially after exposure to the influence of tropical climates. In general these feverish fits pass off without leaving any trace of their existence, beyond languor or weakness, or perhaps some herpetic eruption on the lips. But if the instruments have been used with undue roughness, or the patient has been guilty of any imprudent exposure to cold or stimulants, inflammation of the testicles or an abscess of the perineum may ensue, so as to complicate the case and delay its treatment. False passages also are frequently established, not only by inexperienced practitioners, but by those whose success has led to overconfidence, and induced a want of that extreme caution which is always requisite for the safe guidance of instruments through the urethra. From the dire effects of urinary extravasation it might be expected that injuries of this kind would be always productive of serious, if not fatal, consequences; and such, no doubt, the case would be, if the opening were seated on the vesical or inner side of the stricture. But as it is beyond the contraction, and forms an exceedingly acute angle with the direction of the canal, the safe exit of the urine is favored, while its entrance into the false passage is impeded. The principal inconvenience, therefore, that results from this complication, is the increase of difficulty it occasions in carrying on the dilatation.

Whatever may be the difficulties and danger of the simple dilating process, they are trivial, when compared with those attending the use of Caustic; which, even if it should happen to be correctly applied to the seat of contraction, must expose the patient to the risk not only of immediate irritation, but also of subsequent inconvenience from cicatrization of the ulcerated part. It seems, indeed, surprising, that an agent so uncertain and hurtful should ever have got the credit of proving beneficial for the remedy of stricture, unless we suppose that in the cases where it appeared to do so there was no real contraction. There is a fashion in diseases as well as in their treatment, and when every uncomfortable feeling about the urinary organs was attributed to stricture or enlarged prostate, any means of remedy could not fail to acquire some portion of confidence. But now, when juster notions are entertained on the subject, it is needless to point out the inexpedi-

ency of resorting to the use of caustic under the circumstances in question, which must render its employment unnecessary as well as in the highest degree dangerous.

There is another mode of treatment that may also be discussed in a few words. This is the method of internal incision, which was advocated by Mr. Stafford of London, more than thirty years ago, and has since then found much favor from the surgeons of France, whose ingenuity has been variously exercised in the contrivance of instruments for the purpose. In all such apparatus the essential constituents are a sheath and narrow blade contained in it, which may be protruded from the side or the extremity, accordingly as the instrument can or cannot be conveyed through the stricture. In addition to the uncertainty of this procedure in regard to its immediate effect, and the danger to which it exposes the patient from bleeding, as well as the irritation of urine forcibly urged upon a raw surface, the great objection may be mentioned, that whatever relief is thus obtained does not prove permanent. Indeed it would seem from the results of experience—and this I find, from my communications with patients treated in London, has been much more extensive than might be supposed from what has appeared in writing on the subject—that so far from lessening the disposition to contract, the internal incision rather increases this morbid tendency, so as seriously to aggravate instead of alleviating the disease.

A French surgeon, M. Reybard, has lately endeavored to maintain that all strictures of the urethra depend upon the formation of a new texture, or lining membrane of the mucous surface, which must be completely divided through its whole extent of length as well as thickness, in order to afford permanent relief. For this purpose he introduces a sheath containing a blade which, when expanded, presents its point not backward but *forward*, so that when the instrument is withdrawn it rips open the canal with a certainty no less unerring than relentless. The Parisian Imperial Academy of Medicine have been so much delighted with this procedure as to express their approbation of it by bestowing upon the author the prize of 12,000 f. (£450) bequeathed by the late M. d'Argenteuil, for rewarding practical improvements in the treatment of stricture. How far this distinguished body have acted justly in their decision, will appear from the "Reclamation" which I took the liberty of transmitting for their consideration.* But I may here remark, that M. Reybard limited the employment of his dreadful engine to cases of stricture so accommodating as to permit

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* See Appendix to this paper.

the passage through them of a thick sheath, with the blade contained in it, and held all tighter contractions as beyond the reach of remedy; so that he stopped short of the great difficulty, and merely substituted a bloody, painful, and dangerous procedure for the easy and safe means of dilatation, which are found quite sufficient for the treatment of stricture in its ordinary form of severity. It would be instructive to learn how many members of the Imperial Academy have adopted in practice a mode of treatment in favor of which they have so strongly testified.

There has long been a general persuasion that strictures, especially when complicated with perineal fistula, are apt to become impermeable, or altogether closed against the introduction of instruments, and it was under this impression that the French surgeons employed an operation which they called "Boutonnière." It consisted in cutting upon the point of a catheter conveyed down to the seat of obstruction, and after having thus removed the resistance, completing the passage into the bladder. But although it might be possible in this way to re-establish the natural canal, the chances were greatly against doing so; and although temporary relief might be afforded, there was almost a certainty of future trouble from contraction of the new-formed passage, while failure in completing it in the first instance exposed the patient to great danger from the extravasation of urine, so apt to occur when an opening is made into the urethra on the vesical side of any obstruction in its course. Now there is nothing of more consequence in the treatment of stricture than knowledge of the fact that this alleged impermeability has no real existence, except in those rare, exceptional cases, where the urethra has been divided by violence, and allowed to cicatrize with obliteration of the passage beyond the opening at the seat of injury. It is obvious, indeed, that if the urine is permitted to pass, no matter in how small a stream, or even only by drops, there must be room for the introduction of an instrument, provided it be sufficiently small and properly guided.

In making this statement, it is very far from my wish or intention to allege that the passage of instruments through strictures is always easy, or to deny that the utmost extent of skill and experience may hardly prove sufficient for overcoming the difficulties presented by an extreme degree of contraction, associated with numerous false routes through the sides of the canal. But if the case, as I have endeavored to show, is really one of difficulty merely, and not impossibility, the prospect of successful treatment will be rendered much more encouraging by viewing it in the proper light; and instead of desisting from further attempts under the impression that an insuperable

obstacle exists, the surgeon will patiently persevere in the hope of, sooner or later, discovering the true passage, or seek the assistance of his brethren who are more conversant with this department of practice. In teaching surgery, Mr. Liston repudiated puncture of the bladder as a proceeding never necessary, and always indicative of incompetency on the part of the practitioner, forgetting that daily, or rather hourly exercise in the use of urethral instruments is requisite for any approach to perfection in their use, and that therefore retention of urine would often prove fatal if not remediable by other means. For my own part, I always taught the operations for puncture of the bladder as procedures which might be fully warranted by the circumstances, and especially in the army, navy, or country practice, prove the only available expedients for saving the patient's life. But on the other hand, when hospital surgeons, who ought to have the best opportunities of acquiring dexterity in the use of instruments, confess that they frequently find it necessary to puncture the bladder, the standard of professional skill is lowered to a degree that must prove injurious to the interests of the public. One of those gentlemen lately published the astounding fact that he had witnessed forty instances of this proceeding; and if such testimony were accepted without comment, it might afford a shield to great laxity in the treatment of urethral diseases. I therefore think it right to state, that the necessity of having recourse to puncturing the bladder for retention of urine depending upon strictures has not hitherto been regarded as creditable to a public institution; and that for my own part, during more than twenty years' practice in the Royal Infirmary of Edinburgh, I have, as also in private practice, never found it necessary.

What has been said thus far applies to strictures as they usually present themselves, but not to those which may be distinguished as unyielding, irritable, and contractile. In the unyielding form dilatation, though it may be carried on to some extent, is sooner or later arrested by resistance of the tough texture at the seat of contraction; and if attempts are made to remove this obstacle by forcible distention, the most serious consequences are apt to ensue. In the irritable condition, while all the symptoms of stricture are presented in an extreme degree of severity, the gentlest introduction of instruments is sure to produce great aggravation, not only at the time, but for days afterward; so that the patient is distracted between desire to obtain relief, and dread of the effects resulting from means employed with this view. In the contractile, or spasmodic stricture, as it is usually called, no difficulty is experienced in dilating the canal to its proper capacity; but unhappily with little benefit—the patient

still making water laboriously, painfully, and frequently—by drops, or in a dribbling stream, which is liable to complete obstruction, through the influence of any local or constitutional disturbance affecting the urinary organs.

For the treatment of stricture in these three forms, whether existing singly or combined together, the means of remedy hitherto employed have proved quite unavailing; and the patients thus afflicted are deserving to be regarded as a great discredit to surgery. If poor, they frequent hospitals until dismissed by desire from despair of relief, or are declared incurable, or fall victims to practice more zealous than discreet. If rich, they run the gantlet of European skill—having bougies introduced—caustic applied—internal incisions inflicted; and so on, until with broken health, disappointed hopes, and perhaps empty purses, they retire in dreary seclusion from society to carry on a dangerous and ineffectual system of palliation through means of the various apparatus collected in the course of their wanderings. That this is not an imaginary or overdrawn picture, must be admitted by every practitioner who possesses any considerable field of observation; and will also appear from the cases to be found in any large hospital. Indeed, the following fact is of itself sufficient to show how inefficient the resources of surgery have proved in affording relief under the sufferings in question. A French gentleman, the late Marquis of Argenteuil, bequeathed funds sufficient to provide every five years a prize of nearly £500 in value, for the greatest practical improvement in the treatment of stricture. It is impossible to express more emphatically the amount of torment he had endured, or the imperfect relief he had derived from the treatment which his ample means enabled him so fully to appreciate. The following case affords a good example of the complicated misery resulting from this aggravated form of stricture, as well as in the insufficiency of ordinary treatment to afford relief under such circumstances, and led me to adopt a mode of procedure that there seems reason to hope will prove sufficient for vanquishing the difficulty in question.

Case I.

In 1840 I was requested by the late Dr. Hay to take charge of a gentleman who had suffered long and severely from stricture of the urethra. He was between forty and fifty years of age, of tall stature and robust form. His complaint had existed twenty years, and during the earlier part of this period had been partially alleviated by the introduction of bougies, but had then gradually increased, until at

length the suffering occasioned by it was altogether intolerable. During both day and night, the calls to make water were almost incessant, and excited the most violent expulsive efforts, which, aided by a milking-like manipulation of the penis, and pressure along the perineum, never produced anything more than a scanty dribbling discharge. From the bladder being thus imperfectly emptied, the urine was constantly passing away insensibly, so as to keep the clothes wet, with what discomfort to the patient may be more easily imagined than described. He was peculiarly susceptible in regard to atmospheric changes, and especially in damp weather suffered an aggravation of the symptoms. The urine, when collected on such occasions, was found to deposit large quantities of glairy mucus, from which indeed it was never quite free.

On examination, I found a tight stricture between five and six inches from the orifice of the urethra; and at the second or third attempt, succeeded in passing the smallest-sized bougie fairly through it into the bladder. I then supposed that, as usual, there would not be any further difficulty in treating the case, and desired the patient to call upon me twice a week, unless when the weather or any other circumstance should render a longer delay necessary. The progress, though not rapid, at length enabled me to pass No. 5 of my scale, equal to No. 1 of that in common use, when I found it impossible to make any advance. Indeed there was little encouragement to persevere in attempting this, as, notwithstanding the degree of dilatation that had been accomplished, there was not any appearance of relief from the symptoms of the disease.

I then proposed to confine the patient to bed, and keep a succession of catheters, gradually increased in size, in the bladder. He made no objection, and was greatly pleased to find that, instead of the irritation he expected, there was at once obtained complete relief from all his previous uneasy feelings. He read and wrote, ate and slept, without the least disturbance, drawing off the urine from time to time, and observing to his great satisfaction that the mucus had entirely disappeared. At the end of ten days I withdrew the full-sized silver catheter then employed, and before twenty-four hours had expired found the complaint in every respect exactly as it had been before the process was commenced.

Some months after this, I divided the stricture from within by means of a catheter containing a lancet blade, which was protruded from its sheath after the instrument had been passed through the seat of contraction, and kept in this expanded state while the catheter was withdrawn. A large bougie was immediately afterward passed with perfect

ease; and again hopes of success were entertained. But next day things were precisely in the same state as formerly.

Several months having elapsed without any change, it was resolved to combine the two last-mentioned modes of treatment. In the first place, I divided the stricture as before, but on both sides, by means of two lancet catheters, cutting right and left, and then introduced a full-sized catheter into the bladder, where it was retained for a week. For some time afterward it seemed as if benefit had resulted from this procedure, and the patient, by frequently passing a bougie or catheter through the strictured part, was enabled to make water in a tolerably full stream. But this imperfect relief was of short duration, and by the end of two or three weeks the frequent calls, laborious straining, and copious mucus proclaimed that the stricture had regained its former condition.

The patient now protesting that life was not desirable under the torment of his complaint, and entreating me to employ some efficient measure of remedy, no matter at what expense of pain or risk of danger, I resolved to divide the stricture by free external incision. With this view a small staff, grooved on its convex side, having been introduced, I made an incision in the raphe of the perineum from the bulb to the anus, and then feeling for the stricture, which was easily recognized by its surrounding induration—ran the knife fairly through the whole extent of thickened texture. A full-sized catheter was substituted for the staff, and retained for a few days. The patient suffered little from the operation, except some uneasiness from irritation caused by the urine passing through the wound. When it closed he felt quite well; and he continues to do so, though thirteen years have now elapsed. He has never required the bougie, and in every respect enjoys the most perfect health.

In this case, the obstinacy of resistance and tendency to contract occurred in an extreme degree. Indeed, the latter peculiarity was so strongly marked that it suggested the idea of an adventitious elastic texture, or rather one possessing contractile properties similar to those of the middle coat of the arteries. It is plain that the most prolonged use of bougies would not have effected a cure. And the result of retaining catheters in the urethra shows that this mode of treatment is not so effectual as it has been represented, since it only produced a temporary dilatation. But the most important lesson is to be drawn from the results of the different trials that were made of internal incision by lancet catheters. Additional space was thus at once obtained, and the passing of bougies was greatly facilitated, without any

lasting difference being effected in the contractile power of the stricture. It hence appears that this mode of treatment affords no practical advantage, since, in the ordinary condition of stricture, bougies accomplish recovery on the easiest possible terms; and in its obstinate form, an internal incision does not prove sufficient to relieve the patient. The reason of this, I believe to be, that the obstinate stricture in question requires, for its complete and permanent remedy, a thorough division of the firm texture which surrounds the contracted part of the canal.

This case afforded conclusive evidence that complete relief might be afforded in the most aggravated form of strictures by external incision of the contracted part, but of course could not determine how far the recovery would prove permanent, what dangers might attend the operation, or what was essential to its complete performance and after-treatment. Upon these points, in the first instance, I could only hold out hopes and expectations, founded upon reasonable probabilities; but now, having operated more than a hundred times in cases presenting every variety of condition which the disease can assume, and carefully watched the results during a considerable number of years, I feel warranted to express myself, if not with absolute certainty, at all events with a degree of confidence pretty nearly approaching it.

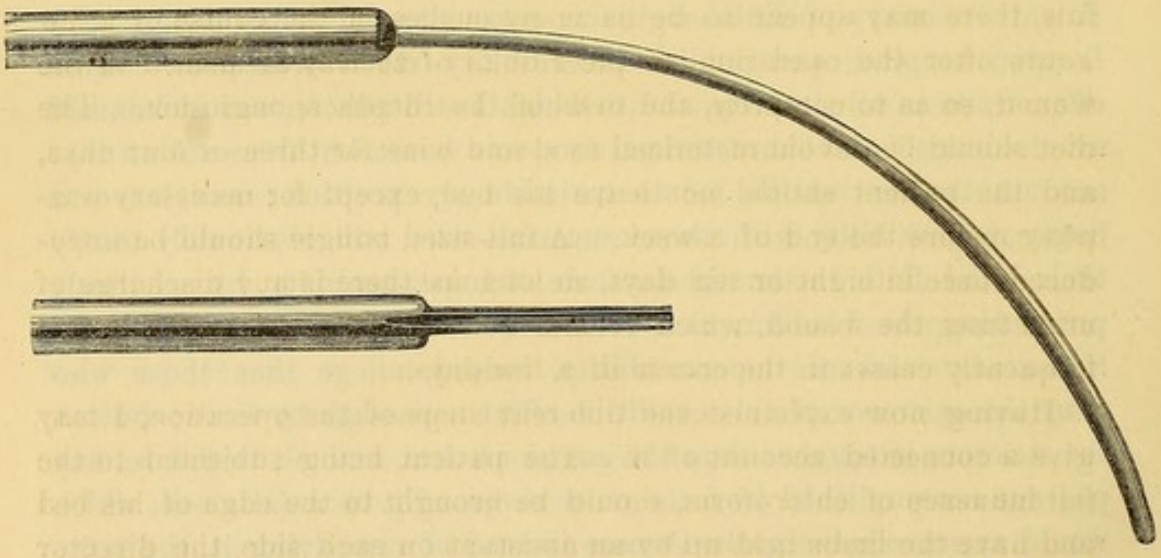
The peculiar and fundamental principle of the treatment about to be particularly considered is to divide the stricture completely by an external incision—not at random, as by the procedure formerly in use—but with certainty and accuracy, through the assistance of a grooved director passed fairly through the contracted part of the canal. This obvious distinction has been strangely overlooked, and the operation which I have proposed has been held responsible for the disastrous effects of the very methods which it was intended to supersede, so that individuals, societies, and journals have paraded the deadly statistics of groping in the perineum without a guide, or opening the urethra behind the stricture, as arguments against adopting a proposal which afforded perfect security from the dangers of these proceedings. It is much to be regretted that, through such misconceptions, the relief placed within their reach has been withheld from many unfortunate sufferers; and I venture to express the hope that any impression so produced will no longer be permitted to oppose the progress of improvement in this department of surgery.

Cutting into the perineum without the assistance of a precise guide exposes to the serious danger of opening the urethra on the wrong side of the stricture, of breaking through the deep fascia, and of

wounding the artery of the bulb, so as to incur the risk of urinary extravasation and hemorrhage, while pressure being the only means available to suppress the latter, must greatly tend to promote the former evil. It is therefore no wonder that this procedure has been looked upon as a forlorn hope, warrantable only in cases of impermeable stricture. But while admitting, as I have already done, that in some rare cases the urethra may be actually obliterated, I maintain that no *stricture* is impermeable, and that if a drop of urine is able to escape, a director of sufficiently small size may be introduced; and in support of this position I appeal to the fact that, although patients alleged to labor under impermeable contractions have come to me for relief from the most distant parts of Scotland, England, and Ireland, from the Colonies, and from America, I have never, either publicly or privately, been unable to pass an instrument since I became satisfied that there was no true impermeability. Believing, from my own experience, that the establishment of this pathological fact was of great importance in practice, I was sorry to see it stated in the medical societies and journals of London, that whatever might be the case elsewhere, the cases occurring there were frequently so aggravated as to be completely impermeable; and supposing that the gentlemen who had engaged in this discussion must be anxious to ascertain the truth of a question so practical, I offered to take under my charge, in the Royal Infirmary of Edinburgh, any cases deemed impermeable in a London hospital, and publish the results of their treatment. This offer, made in all sincerity, and to which I still adhere, was nicknamed a "challenge," and characterized as a vain boast, but does not on that account the less entitle me to maintain my position; and leaves a heavy responsibility with those surgeons who still obstinately testify their blind faith in the old doctrine of impermeability, by needlessly puncturing the bladder, and recklessly cutting into the perineum. Some advocates of impermeability, indeed, allege that those who deny the existence of this condition effect a passage by force; but as the stricture is tougher than the sound urethra, and as, therefore, any passage accomplished by force must necessarily be a false one, which would aggravate the patient's case instead of remedying it, the satisfactory result of treatment affords a most complete refutation of such statements. As already stated, it is far from my intention to allege that the introduction of instruments may always be accomplished with ease. In general, I have succeeded at the first attempt; but in many cases, have had to wait days, or even weeks, before the passage could be hit. Indeed, on three occasions—one in private and two in public —I found it necessary to open the urethra anteriorly to the stricture,

so as to obtain the assistance of a finger placed in the canal to guide the point of the instrument. It is the preposterous system of "tunneling," as it has been called,—or attempting, by long-continued pressure, to pass large bougies or catheters through a tight contraction,—that gives rise to the greatest difficulty in accomplishing this part of the operation, since there is thus formed a cul-de-sac beyond the stricture, but nearly in the proper direction of the canal, so that if small instruments are afterward used, false passages are apt to be formed at the bottom while the true one exists at the side of the excavation.

Although there may be two or more strictures in the same urethra, it is seldom necessary to divide more than one; since, if the contraction upon which the symptoms are chiefly dependent be remedied, there is usually little difficulty in subduing the other. This "master stricture" generally lies before the bulb, but is sometimes met with before the scrotum. It is recognized by tightness, obstinacy, irritability, and if in the anterior part of the canal, by a firm oval swelling of the urethra. Before proceeding to the operation, it is proper to ascertain that the catheter which is to be left in the bladder can be passed down to the stricture it is proposed to divide, and, if necessary, remove any obstruction to its progress by the use of bougies.



The director I originally employed was of the size No. 1 of the catheter scale, and of the same thickness throughout, but was found inconvenient, from not affording any indication as to the seat of contraction when passed fairly through it. I therefore tried the effect of sheathing it with a piece of flexible catheter, so as to leave three inches of its extent from the point exposed; and as this completely attained the object in view, I had an instrument made of solid steel,

in the same form, which has wonderfully facilitated the process, and also rendered it much more sure of being effectual.

The best knife for dividing the stricture is a short bistoury, with straight back and slightly convex belly. It should be inserted in the groove of the director, nearly an inch beyond the thick part, and pushed forward to the notch, when both instruments, being held firmly by the operator, are carried in an outward direction so as to divide the stricture completely, which may be felt by the giving way of a firm texture, and is proved by the thick part of the instrument no longer meeting with resistance. I at first supposed that division of its contracting ring at its narrowest part was sufficient for the purpose, but have long been satisfied that so limited an incision exposes the patient to relapse, since there is generally, for some extent on both sides, a narrow or conical shaped portion of the canal capable of reproducing the symptoms of disease.

The catheter should be a silver one—as being more easily introduced and retained than those of flexible materials—and be kept in the bladder for forty-eight hours, but not longer, since it may annoy the patient, and can do no good beyond this period—as there is then no risk of extravasation—and it is hardly desirable that the urine should at once resume its proper course. If the patient shows a more than usual disposition to bleed—so that, instead of one or two teaspoonfuls, there may appear to be as many ounces in the course of a few hours after the operation—a piece of dry lint may be placed in the wound, so as to compress the cells of the corpus spongiosum. The diet should be devoid of animal food and wine for three or four days, and the patient should not leave his bed, except for necessary purposes, before the end of a week. A full-sized bougie should be introduced once in eight or ten days, so long as there is any discharge of urine from the wound, which seldom continues beyond a month, and frequently ceases in the course of a few days.

Having now explained the different steps of the operation, I may give a connected account of it. The patient being subjected to the full influence of chloroform, should be brought to the edge of his bed and have the limbs held up by an assistant on each side, the director is then introduced and confided to one of the assistants. The operator, standing or sitting in front, cuts into the perineum, exactly in the middle line—to the extent of about an inch and a half—having the seat of stricture for its center, and continues his incision in the same plane until the director is felt; he then, resting the knife on the fore-finger of his right hand, guides its point into the groove, and effects complete division of the contracted part of the canal, in the

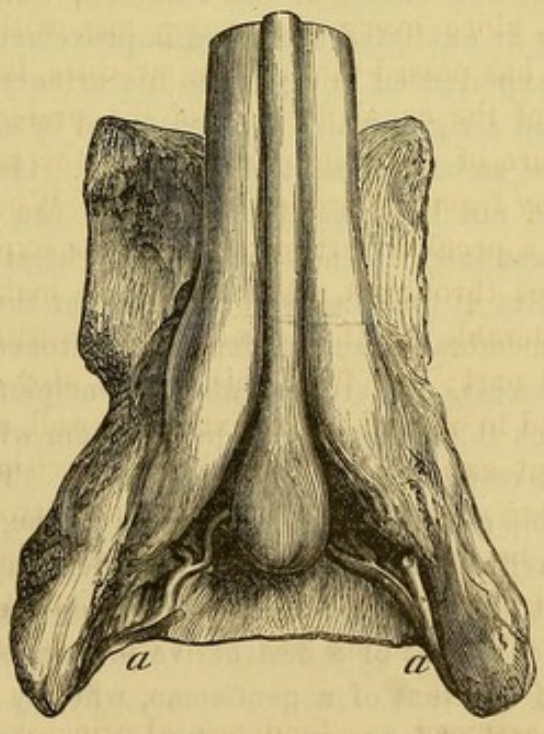
way that has been described. The catheter is then introduced, and bound by tapes passed through the rings, and tied to bands, which, after being carried, on each side, round the upper part of the thigh, are fastened to one encircling the loins, so as to maintain the position of its point just within the bladder.

The only sources of danger that can be attributed to the operation, are bleeding and extravasation of urine; and in order to estimate the importance due to them, it is necessary that the true position of strictures should be ascertained. If they existed in the prostatic or membranous portion of the canal, extensive incisions, involving the deep fascia of the perineum, would be requisite, and accordingly this has been made a serious objection to my proposal by writers who quote the authority of Sir B. Brodie and others, to prove the occurrence of stricture behind the bulb. But the fact is that the seat of contraction is never so far back, and may be positively limited to that portion of the urethra which extends from the bulb to the orifice. The ground upon which I make this statement is, that in all my experience I never found it necessary to cut farther back than the bulbous portion, for the conveyance of a full-sized instrument into the bladder. It is easy to understand how the mistake in regard to position has arisen, since every obstruction met with by a bougie or catheter, after it has passed through the stricture, is naturally referred to contraction of the canal, instead of the preternatural dilatation caused by pressure of the urine, that allows the point of an instrument to go astray from its proper direction. When the stricture is tight and firm, a peculiar jarring sensation is experienced while an instrument passes through it, which is apt to make the contraction appear of considerable length, instead of being little more than a ring at the narrowest part; and from this source also erroneous impressions are derived in regard to the extent, as well as the position of the disease. But experience founded upon division of the stricture is truly the *experimentum crucis*, since the introduction of a full-sized instrument beyond the seat of incision affords positive proof of the urethra not being contracted any further; and this I have done in many cases where the stricture was believed to be in the membranous portion.

It being then assumed, as a fundamental principle, that incisions for the remedy of stricture do not require to be carried farther back than the bulb of the urethra, it follows that there is no occasion for cutting through the deep fascia of the perineum or extension of the triangular ligament, and consequently, that if the urine should become extravasated, its diffusion must be limited to the scrotum and other external

parts. But if a large catheter be retained in the bladder, there is no risk of any such occurrence, and therefore this source of danger may be put entirely aside.

The hemorrhage attending this operation can proceed only from vessels of the integuments, from the corpus spongiosum, or from the artery of the bulb. But the vessels of the integuments are never of any considerable size, and in the middle line, or raphe of the perineum, are so small as to afford, when divided, little more than a few drops of blood; while wounds of the corpus spongiosum, though capable of bleeding to some extent in a full or sanguineous state of the system, may be easily prevented from doing so by slight pressure applied at the part concerned; and the artery of the bulb lies at the side of the urethra, so that it cannot be endangered by the knife if it is confined to the middle line. It was a serious error in the Parisian Academy of Medicine, to represent the arteries of the bulb as seated on the lower part, so as to render incisions in a lateral direction the most free from danger; and as with many minds authority has a greater influence than matter of fact, I shall endeavor to counteract the mischievous impression that may thus have been produced, by here repre-



senting the actual relation of parts as they exist in a preparation kindly supplied to me by my colleague, Professor Goodsir. It is evident from this view of the vessel in question, that it cannot be wounded by any incision in the middle line.

By these considerations in regard to the security from extravasa-

tions of urine and hemorrhage, I was originally led to expect that the operation would prove nearly, if not entirely, free from danger; and this anticipation has not been disappointed. Having declined no case presented for treatment, and operated at all ages, from 77 downward, as well as under every variety of complication from long existence, alleged impermeability, and the false passages of previous mismanagement, I have now performed the operation 108 times, with only 2 fatal results that can be ascribed to it. One of these was a poor, miserable creature, 39 years of age, admitted into the hospital on the 11th day of July last, suffering from a stricture so irritable that he refused to have it examined even, except under chloroform. He had been under my care some years previously, and then declined to suffer the ordinary means of relief; but at length, finding the complaint intolerable, he expressed his willingness to permit any measures that might be deemed expedient, provided they could be accomplished while he was unconscious of pain. Under these circumstances I at once divided the stricture, which was anterior to the bulb. The patient was extremely restless after the operation, and could not be prevented from frequently altering his position, so as to affect in a corresponding degree the fixture of the catheter; but, nevertheless, on the following day he exhibited a marked improvement of appearance, from the relief experienced in regard to his urinary evacuation. In the evening he had a rigor, which was succeeded by extreme frequency of pulse and great embarrassment of breathing. On the sixth day he died. There had not been any bleeding, and the parts concerned, when carefully examined, did not show the slightest trace of urinary extravasation. But at the fundus of the bladder there was a red spot on the mucous membrane, and under the peritoneum, opposite this point, a small abscess. There was also an incipient abscess in the left arm, and much thickening of the pericardium with effusion, which appeared to have resulted from previous disease. The most probable explanation of this result, therefore, appears to be, that the patient being in a very irritable state while the bladder was very much contracted, the point of the catheter, by pressing on the mucous surface, caused the commencement of a destructive process of suppuration.

The other case was that of a gentleman, who, by means of the operation in question, had for more than twelve months been completely relieved from a contractile stricture, which was aggravated instead of being improved by the ordinary means of treatment; but subsequently, suffering a partial return of the symptoms, desired a repetition of the procedure which had occasioned him so little trouble and afforded so much comfort. Believing that the tendency to relapse proceeded from

the contracted part not having been divided with sufficient freedom, I readily complied with this request. The catheter was removed on the second day, when the patient seemed perfectly well. On the third day he expressed himself as being so; and on the fourth I found that, without waiting for my sanction, he had dressed and left his bed-room. In the afternoon of that day, while still feeling perfectly well, he went to make water in his bed-room, and then felt an acute pain, which made him faint and fall in the passage with such force as to graze the skin of his eyebrow and knee. At the same time he had a severe rigor, and, in recovering from it, complained very much of the injured parts. Next day the pain of his knee became intense, and the eye exhibited signs of internal inflammation. Symptoms threatening effusion into the pericardium then ensued, but disappeared after the application of blisters. The urine passed freely, and there was no swelling of the scrotum or perineum. In the course of a fortnight, although it was evident that suppuration had taken place at the knee, and that the eye was obscured by effusion of lymph, such an improvement took place in other respects that expectation of recovery was entertained both by Dr. Christison and myself. But in the commencement of the fourth week indications of cerebral excitement presented themselves, and soon assumed an alarming character, which, in a few days, were verified by the death of the patient. His body was not examined, but the nurse who assisted in arranging it saw that some matter issued from the wound which had seemed quite closed. As extravasation of urine, four days after the operation, is quite out of the question, I suppose there can be no doubt that the local suppurations and fatal termination must be attributed in this case also to a pyemic state of the system.

Had these two cases happened at an early period of my experience in dividing strictures, they would have occasioned much apprehension and distrust. But as before meeting with them I had performed the operation nearly a hundred times without encountering any instance of a fatal consequence, my only feelings were regret for the individuals, and determination to be more than ever careful in enforcing the restrictions of after-treatment; since, if the catheter had not been tied quite so far into the bladder in the first case, and the patient in the second had not left his bed quite so soon, I entertain no doubt that the usual results would have been obtained.

The only instance of hemorrhage with which I have met occurred in my ninety-eighth case, and under circumstances so peculiar as to occasion no ground of apprehension for the future. The patient was a gentleman fifty-nine years of age, who had been an invalid nearly

all his life. At an early period he had escaped with difficulty from repeated attacks of hemoptysis, attended with serious impairment, if not, as it was believed, the complete destruction of one lung; and afterward he had been a victim of rheumatism, with various other ailments, of which the most distressing was a stricture anterior to the bulb. For this complaint he had been treated by various eminent surgeons in London, one of whom, no longer ago than last winter, in vain contended against the contraction by means of bougies for some months. Though fully aware of this gentleman's feeble and shattered state, I felt such confidence in the safety and efficacy of the operation as to be induced at once to undertake it. Everything went on favorably for seven days, the wound being closed, and the patient making water in a full stream entirely by the natural passage, when, without any warning, a discharge of blood, to the amount of an ounce, took place from the urethra. As this unpleasant occurrence was repeated several times during the next two days, I reintroduced the catheter, and retained it in the bladder for forty-eight hours, with the effect of checking any further external hemorrhage, but, at first, without preventing the urine from being bloody. For nearly ten days it seemed as if there was no longer any cause of alarm, but then the bleeding returned more seriously than ever, and resisting the control of a catheter which was again introduced, together with carefully applied pressure on the perineum, obviously required some measure of a decided character. I therefore passed a grooved director, cut in the line of the wound, and freely opened the urethra so as to ascertain the source of hemorrhage. It proved to be a vessel in the coat of the canal on its lower surface, which was seized by forceps and tied, with the effect of completely and finally putting an end to the bleeding. Whether this vessel bled from a hemorrhagic tendency, or was a *lusus naturæ*, or merely a morbid derangement, induced by the long teasing and irritation to which the urethra had been subjected in the course of its previous abortive treatment, I leave the reader to determine; but venture to express the hope, that as the appearance of one swallow is admitted not to make a summer, one instance of bleeding in a hundred operations will not be regarded as good ground for apprehending hemorrhage.

Still more groundless, if possible, than the fear of hemorrhage, is that of the wound remaining fistulous. Indeed, so far from there being any risk of this occurrence, it may be stated that of all the means hitherto devised for the remedy of fistula in perineo, a free division of the contracted part of the canal is the most effectual, as might be expected from the state of matters concerned. If the ob-

stinacy of such a fistula depends upon its communication with the urethra on the bladder side of a stricture, which, impeding the flow of urine through the natural channel, directs it into the morbid one, and also upon the tortuous course of sinuses which results from the fascia of the perineum opposing the passage of matter formed under it toward the surface, it is obvious that a sufficiently free incision in the middle line must at once completely remove the obstacle to recovery. It is true that perineal fistula may exist under different circumstances, as when it depends merely upon the patient's bad state of health, or other causes not connected with stricture; and then although a free drain in the proper situation will still afford the best chance of recovery, the failure of this measure cannot be justly held to invalidate the efficacy of division in cases where the urethra is really contracted. Yet instances of such experiments and abortive attempts to afford relief have been diligently sought out, and perseveringly published with the grossest exaggeration as evidence of the operation which I advocate being apt to cause the production of fistula. I am also aware of cases in which the stricture, from being missed or imperfectly divided, has forced the urine to flow through the wound, and thus delayed or prevented its healing; but, on the whole, I feel warranted to state, that when the operation is properly performed it can leave no fistulous opening unless one has existed previously.

While the operation may thus be regarded as exempt from the risk of hemorrhage, urinary extravasations, and fistulous effects, it is here proper to remark that there are not unfrequently symptoms of an alarming character, and which, under other circumstances, would justly excite the most serious apprehension. These are rigors occurring alone or associated with bilious vomiting, suppression of urine, or delirium. They generally present themselves during the first two days, and are seldom met with beyond the third. In the great majority of cases they pass off in a few hours without the slightest disagreeable consequences; but on rare occasions, just as in the feverish attacks attending the introduction of a bougie, leave some local derangement, such as a swelled testicle or abscess of the scrotum. There is no treatment required on the occasion of these attacks, and if the surgeon has had sufficient experience to feel confident that there is no real danger, he will be able to administer the only practicable relief by assuring the patient and his friends that the state of nervous irritation will quickly subside. I have already mentioned the only two cases in all my experience where the rigors were followed by serious consequences, and in both of these it will be recollected there were peculiar circumstances calculated to give the constitutional disturbance a local direction, as

in one the catheter pressed on the bladder, and in the other the patient had a serious fall from being out of bed too soon.

The good effects of the operation may be divided into immediate and remote. The first extending to a period of some months' duration, and the latter existing through the remainder of the patient's life. Now, whatever may have been the condition of the stricture, whether irritable, contractile, or obstinate, and whatever may have been the severity or duration of the symptoms, complete relief in the first instance has invariably resulted from every operation that I have performed. Instead of the slow and frequently interrupted progress of improvement which usually attends the use of bougies, all the distressing symptoms quickly disappear, not unfrequently without an hour's delay, and at all events in the course of a few days. If the urine has been thick and loaded with mucus it becomes clear and limpid. The frequent and distressing calls to micturition are succeeded by a state of blissful repose. The most obstinate and unyielding contraction admits with ease instruments of the largest size; and the most irritable stricture, which could not previously be touched without the production of spasms and ague, permits the passage of bougies without the slightest uneasiness either immediate or consecutive. The urine, instead of being passed by drops or escaping incontinently, flows freely in a copious stream, and the patient, however much worn down by suffering, speedily regaining his appetite and strength, appears to his friends like a new edition of himself. The relief thus obtained having proved no less permanent than complete in many cases of the most hopeless character, I think the fair presumption is, that when relapses do take place there must be some reason for such exceptions from the general rule, and that the duty of practitioners, consequently, is not to search out these failures as objections to a proposal for the remedy of contractions confessedly incurable through other means, but rather to study the subject in a candid spirit of inquiry, with the view of ascertaining the circumstances essential to success.

Having communicated my own early, and of course crude observations to the profession, in the expectation that they would lead more rapidly to this result than if they had been limited to my own field of practice, I am rather surprised to find, at the end of five years, that little, if any, additional information has proceeded from other sources —that my anxiety to lose no time in suggesting what seemed to be an improvement in surgical practice has been characterized as unbecoming precipitancy—and that the sanguine expressions of my own confidence have been attributed to a reckless desire of proselytizing,

or even to some other motive of a still less excusable kind. That the rapacious quacks who have so long made strictures of the urethra a profitable source of gain should oppose the introduction of an efficient method for rescuing the victims of their extortion from the toils of an incurable malady, is not at all surprising; and that members of the profession who have not acquired the art of passing instruments safely through urethral obstructions should view with coldness a proposal essentially requiring for its successful application the utmost familiarity with operative manipulation, is quite consistent with what was to be expected. But that the leading members of the profession should have displayed such apathy in regard to a matter so deeply affecting the interest of their patients, could hardly have been anticipated. If, then, the following attempt to account for the sources of occasional relapse should not appear altogether perfect, it will, I hope, be recollected that no assistance has been accorded toward making the explanations more complete.

The most obvious and certain causes of relapses would appear to be adhesion by the first intention between the edges of the incision made through the strictured part, which must restore the state of matters that existed previously to the operation. It might be expected, indeed, that the stream of urine, passing over the raw surface, would effectually prevent any such occurrence; and so I believed must be the case, until taught a different lesson by the following observations: A gentleman came to Edinburgh for division of a stricture anterior to the bulb; and I proceeded to the operation so soon as it was found that a director could be passed through the contracted part. But when I came to introduce the ordinary sized catheter, its entrance was resisted by a firm ring at the very orifice of the urethra, which required a little gentle compulsion for accomplishing the object. The patient did well, and made no complaint, except of uneasiness from the orifice being thus stretched; and when the catheter was removed at the end of forty-eight hours, I expected he would be quite comfortable; but to my surprise I found that, whenever he made water, which passed entirely by the natural channel, acute pain was felt, and followed by rigors. On the fourth day after the operation, I was sent for during one of these attacks, which presented alarming characters from its severity, and being attended with bilious vomiting; and not doubting that all this disturbance proceeded from the contracted orifice of the urethra, I did not wait for the subsidence of the rigor, but at once ran a knife through this dense ring on the side toward the frænum, and had the satisfaction of seeing the patient immediately become quiet. A few hours afterward I found him perfectly comfort-

able, passing water in a full stream without the slightest uneasiness, and in every respect quite well. So he continued, going out daily, and I supposed that all was right, until the end of another week, when I thought it would be proper to pass a full-sized bougie, and, in attempting this, found the orifice precisely as it had been before my incision, presenting the appearance of a firm round ring, which obstinately resisted the entrance of an instrument beyond a small size. Although not productive of any troublesome symptoms at the time, as this contraction prevented the use of means proper to maintain the posterior part of the canal expanded during the process of healing, it was obviously necessary to remove the obstacle thus presented; and having again cut through the ring, I interposed a piece of lint between the edges, with the effect of obtaining a free and permanent enlargement. As the incisions were precisely the same in extent on both occasions, and made precisely in the same way, the difference of results can be attributed only to the means employed on the second occasion to prevent primary adhesion; and it is obvious that if the stricture could thus be renewed, a mere division of the contracted part is not sufficient to insure prevention from relapse. If the stricture is tight, the presence of a full-sized catheter will go far to prevent approximation of the cut edges; but if it be of that dilatable kind which requires the operation merely to remedy a spasmodic or resilient tendency, the risk of reunion will be considerably greater; and it is accordingly in such cases that I have found the disease most apt to return. At the expense of somewhat prolonging the process of recovery, it will therefore be prudent, with the view of promoting its permanency, to allow the urine in the first instance to pass through the wound, which may be easily done by introducing the finger occasionally, so as to feel the surface of the catheter.

Another cause of relapse, I have no doubt, is making too limited an incision through the stricture; since the canal is frequently, if not always, contracted on each side of it into a conical form—so that if the whole of this part is not divided, the portion remaining may reproduce the symptoms. This error was very apt to be committed when the operation was performed by means of a director possessing the same thickness throughout the whole of its extent, but may be certainly avoided with the assistance afforded by the guide I have suggested for ascertaining, at the time of incision, the precise situation of the stricture.

As in all wounds and injuries of the urethra contraction of the canal is apt to occur if a full-sized instrument is not occasionally introduced during the process of healing, this precaution should not be

omitted. It does not appear, however, that the use of such means requires to be continued so long as a few drops of urine escape by the wound, the early period being the most important. But if there should be any contraction of the canal, however slight, anterior to the part principally affected, it is of great consequence that a bougie should be passed through this extent, at least until the cure is complete, since I have always observed that any impediment to the flow of urine through its natural channel tends more than could be anticipated to prolong its escape by the wound.

Independently of these causes, the tendency to contraction may be maintained by a source of irritation in some other part, as by a stone in the bladder. The influence thus exercised is so well known as hardly to require particular notice or illustration, and was long ago impressed upon myself by a case which afforded the late Mr. Liston his first opportunity of performing the operation of lithotomy. The patient, in addition to a large stone in the bladder, suffered from a tight stricture anterior to the bulb, which had resisted prolonged and careful attempts on my part to effect dilatation by bougies. At length it was resolved to cut him upon a small staff, and three, of very slender size, were constructed for the purpose. But when the patient was placed on the table, the operator found it impossible to pass any of these instruments through the stricture, and asked me to try, which I did, fortunately with success, so that everything went on favorably; and although the gentlest introduction of a bougie had previously been apt to induce attacks of fever, with, on one occasion, inflammation of the testicles and sloughing of the scrotum, all the liberties to which the urethra had been subjected on this occasion failed to produce the slightest disturbance. It was, therefore, supposed that the peculiar obstinacy and irritability of the stricture had depended upon the stone, and when it was found, about a fortnight after the operation, that a full-sized instrument could be introduced with perfect ease into the bladder, no doubt remained as to the reality of this connection. Thirteen years ago Dr. Combe asked me to see an Officer of Artillery at Leith Fort, who suffered from stricture, and had, on several occasions, been relieved with great difficulty from complete retention of urine. The contraction was anterior to the bulb, and admitted only instruments of the smallest size, without any relief to the patient's incessant and intolerable sufferings; which made him, I believe, sincerely pray for death as the only termination of his misery. Having ascertained that there was a stone in the bladder, we advised its removal, and I performed the operation on a staff the size of No. 1 of the bougie scale, with the effect of affording complete and

permanent relief, no resistance being afterward opposed to the introduction of large instruments. The patient afterward served with comfort both at home and abroad; and the last time I saw him was at Woolwich, where he held an important situation, in the enjoyment of perfect health. Within the last twelve months alone I have met with five cases in which urinary concretions existed in the urethra behind the stricture. They are very apt to escape detection, from lying in a sort of pouch on the lower side of the canal, and must of course be removed before the cure is rendered complete or lasting.

But if the irritation of a stone in the bladder be sufficient to maintain the contractile disposition, it seems reasonable to conclude that an irritating disease in some other portion of the urinary organs, or even in those of the digestive function which are so intimately associated with them, may produce a similar effect; and, therefore, while all such adverse influences should be carefully recognized, and, if they permit, removed, it is obvious that cases may occur in which permanent relief cannot be afforded, in consequence of the seat or connection of the opposing irritation. But surely the possible existence of these exceptional conditions would not constitute a good ground for rejecting a mode of treatment which, at the worst, can only fail to do good, and, in the great majority of cases, proves an effectual remedy for one of the most distressing, and, under all other means of relief, the most hopeless, diseases to which the human body is liable.

It will now be proper to give some examples of the operation being performed with advantage, and with this view I might relate almost any of the cases in which it has been employed; but as the instances thus afforded would be inconveniently copious, I think it better to select merely proof sufficient to maintain the different points I have endeavored to establish. Many of the cases most remarkable for severity, duration, and obstinacy, have occurred within the last year or two; but as the results of their comparatively recent treatment might not be deemed so satisfactory as those of older standing, my choice will be chiefly from the latter.

Case II.

E. M., aged forty-one, a plasterer, was admitted into the Royal Infirmary on the 13th of November, 1848, on account of urinary irritation, and inability to pass his urine through the natural channel. He stated that about nineteen years before he had fallen across a beam of wood and bruised his perineum, which injury was accompanied by a slight discharge of blood from the urethra, and, for a few days, by

retention of urine, requiring the catheter to be introduced. A small induration gradually formed in the perineum, behind the scrotum, and about twelve years afterward he had again retention for several days. Three years before admission under my care he suffered from a similar attack, and subsequently experienced more or less difficulty and pain in passing urine, with enlargement and increased uneasiness of the perineal swelling. More recently he was admitted into the hospital, under the care of the late senior ordinary surgeon, for relief from stricture of the urethra. Bougies were passed regularly, and under this treatment the hardness in the perineum nearly disappeared. After a residence of five weeks, he was dismissed almost quite well. Soon after leaving the hospital, he was exposed to cold and wet, and his complaints returned with increased severity. The swelling of the perineum and scrotum enlarged rapidly. An abscess formed, and a considerable quantity of matter was evacuated by incision; and in a few days the urine began to escape through the opening thus made.

At the period of his final admission (13th November, 1848), there was great induration of the perineum and scrotum, with two fistulous openings about an inch from each other, through one of which the chief part of his urine escaped. The patient, from long suffering and disturbance of sleep, which he was not permitted to enjoy for more than a few minutes at a time, was extremely irritable and desponding, and derived no benefit from the introduction of instruments through the stricture, which was situated about five inches from the orifice of the urethra.

On the 20th, I introduced a grooved staff into the urethra, and cut upon it in the perineum through the contracted part, making an incision about two inches in length. A full-sized catheter was then introduced, and retained in the bladder. The catheter was withdrawn at the end of forty-eight hours, after which the patient did not make a drop of water through the wound, and was at once completely relieved from all his previous sufferings. He quickly regained his sleep, appetite, and strength, and was dismissed cured on the 2d of December.

This man continued to reside in Edinburgh; and as he labored under a disease of the heart, for which medical assistance was occasionally required, afforded an opportunity of ascertaining, by the introduction of full-sized instruments, that he remained perfectly free from stricture until the period of his death, about two years afterward.

Case III.

In 1844, Dr. Wickham of Penrith brought me a case of stricture which had proved peculiarly obstinate and distressing. Although the patient was under fifty, it had existed twenty-seven years, and during the whole of this long period had never derived more than an imperfect degree of palliation from the use of bougies, notwithstanding their repeated and varied employment. Latterly, the symptoms having become much more severe, the assistance of a practitioner, deemed very skillful in the treatment of such cases, had been required; but the patient returned home after two months' assiduous attempts to pass instruments, without ever having one introduced, and presented a new feature of alarming character in a tumor of the perineum, so prominent, circumscribed, and of such stony hardness, as to suggest serious apprehensions of carcinomatous degeneration.

Upon examination, I found that a full-sized instrument could be passed, without pain or bleeding, down to the left side of the anus, fully an inch and a half beyond the probable or rather possible seat of stricture, which did not surprise me when I learned that the bougie had been used by pressing its point steadily upon the seat of resistance, so as to produce what has been called a "tunneling" effect. Regarding the perineal tumor as the result of local irritation, I did not hesitate to make a free incision through its whole length. It was almost of cartilaginous firmness, but contained a few drops of matter in the center, and it speedily disappeared after a free drain had been established. I then turned my attention to the urethra, and knowing that the mouth of the *tunnel* must be anterior to the stricture, searched for the contracted orifice of the canal at a little distance before the bulb, where it was soon found, so as to permit the passage of a small catheter fairly into the bladder. At the end of six weeks the patient returned home, as I hoped effectually relieved by dilatation; but in the course of a few months he returned, with the symptoms of stricture no less urgent than before.

I then introduced a grooved director through the contracted part, and freely divided it by external incision. In a few days the patient felt quite well, being, for the first time since the commencement of his disease, completely relieved from the uneasiness attending it, and greatly delighted with the facility no less than the efficiency of his treatment by the knife, instead of the tedious and abortive experience which he had had of the bougie. In reply to an inquiry at the end of more than eight years, which I addressed to Dr. Wickham, he says:

"Agreeably to your request, I have seen Mr. —— to-day, and, so

far as regards the stricture, I would say he is quite well. It is more than a year since any instrument has been passed into the bladder. On the last occasion I passed No. 13, with great ease."

Case IV.

Mr. ——, æt. thirty, came from Ireland in December, 1849, to place himself under my care on account of a stricture in the urethra. He had at first become aware of its existence ten years before, from suffering retention of urine and requiring the catheter, which was introduced by a surgeon in Drogheda. From that time he had continued to labor under the symptoms of stricture, and sought assistance from a great variety of sources, but without ever having another instrument passed through the contracted part of the canal. In England and America attempts without end had been made, unsuccessfully, to accomplish this object; and upon one occasion, for nearly two months, Mr. Liston, in London, tried every other day in vain to introduce a bougie. At length the patient, despairing of relief, resolved to endure the complaint, without any further attempt to remedy it, and continued to do so until the symptoms assumed that intolerable form in which the discomfort of incontinence is added to the difficulty of evacuation. He then committed himself to my charge.

In little more than a week I was able to pass a director through the stricture, which I divided by external incision upon the guide thus afforded. Recovery was delayed by a little of the urine getting into the scrotal integuments, but was completed by the end of six weeks, and the patient then returned home in the enjoyment of perfect health. On the 20th August, 1850, he wrote to me in the following terms:

"I promised to let you know how I was getting on, when I left Edinburgh, and as it is now a long time since I wrote to you, I have a good opportunity of knowing how matters stand. I am delighted to say that there has never been the slightest obstruction or difficulty in making water, or in passing the bougie, which I do myself about once a month." In the following year, 1851, I wrote to inquire if the relief still continued, and received for reply: "On my return, last Saturday, from England, I found your kind note, inquiring after my health. In answer, I am delighted to be able to tell you that I have never felt the slightest return of my old malady. I sometimes pass the bougie, but it is only to satisfy myself, as I think now it is no use doing so. My health was never so good, and I can undergo more fatigue (which I do) than I ever could in my whole life."

The case affords encouragement to treat strictures deemed impermeable as accessible to the introduction of instruments, through their careful and persevering employment. It also illustrates the change in contractile disposition, which results from dividing the parts concerned by external incision.

Case V.

Lord ——, æt. thirty-five, applied to me in the month of October, 1852. He had suffered long from a stricture anterior to the bulb, and during the last five years had been under the treatment successively of Mr. Copeland, Mr. Liston, and Sir B. Brodie, who had employed dilatation by bougies, with the effect of affording partial but neither complete nor permanent relief, micturition being always more or less uneasy, and a corresponding degree of constitutional disturbance preventing the patient from ever having the enjoyment of perfect health. At length it was remarked that whenever he made water a considerable swelling took place behind the stricture, and that after the expulsive efforts of the bladder ceased a quantity of urine could be made to flow by pressure upon this part. As such a state of matters seemed to threaten the danger of extravasation it excited much alarm, and was deemed to require an aperture by incision. Instead of submitting to this proposal, the patient thought proper to request my assistance, and, regarding the dilatation of the urethra as an effect of the stricture, I resolved to strike at the root of the evil, by dividing the latter while I opened the former.

Chloroform having been administered, I introduced a small grooved director, and made an incision, as usual, in the middle line of the perineum, then pushed the knife through the dilated part of the canal into the groove, and carried it forward so as to divide the stricture completely. A No. 8 silver catheter was next passed with perfect facility, and retained in the bladder for forty-eight hours. During the first thirty hours no uneasiness was experienced; but at the end of this time the train of nervous symptoms, to which I have adverted as no unfrequent occurrence, commenced, and continued for about the same period, so as to alarm the patient and his friends, although they did not occasion me the slightest anxiety. The urine did not escape at all through the wound, but, to the patient's great contentment, flowed copiously from the extremity of the urethra in a full stream, very different from that to which he had been so long accustomed. Convalescence was soon completed, without any interruption worthy of notice, and the recovery has been in every respect complete. I passed a full-sized bougie on two occasions within the first three weeks, twice

since then, with the interval of as many months, and twice at the end of six months, with the most perfect facility.

From this case it appears that dilatation is not always sufficient for the remedy of stricture. The patient being a nobleman of the highest connections in London, and having the assistance of three surgeons, the most distinguished for skill and experience in the treatment of urethral disease, it must be supposed that the bougie was employed with every circumstance calculated to promote its efficiency. Yet we see that the disease, so far from being cured by these usual means, was very imperfectly palliated, and not prevented from producing effects of the most alarming kind. We also in this case see that a painless operation, followed by a few days' confinement, not only arrested the mischief in progress, but completely accomplished what a long trial of the ordinary treatment, in hands pre-eminently skillful, had failed to effect.

Case VI.

Captain ——, R. N., applied to me in January, 1851, on account of a stricture, of which he gave the following history in writing: "It was in the year 1829, when serving as a midshipman on board H.M.S. ——, in the Mediterranean, that I first observed symptoms of stricture, produced by gonorrhœa. Bougies were then introduced, and in a short time the complaint seemed to be overcome, and continued so up to 1833, when I was in the East Indies, on board H.M.S. ——, and suffered very much on boat-service, hunting pirates, etc., which exposed me to wet, and rapidly increased the complaint. I sought relief on board the ship, but found none, as the medical men could not pass an instrument, and by their attempts generally induced complete stoppage of urine, when bleeding and the warm bath were the only means of any service. This state of matters continued for two years, until the ship was paid off, no instrument having been passed. Having got a little better from living quietly on shore, I sailed, in May, 1836, as —— Lieutenant of H.M.S. ——, for the Arctic regions, and up to the end of that year suffered little, except the inconvenience of making water almost by drops. But the ice then suddenly broke up, exposing the ship to great danger, and obliging officers as well as men to expose themselves for considerable lengths of time to very low temperatures, even 80° below the freezing point, and upon some occasions to quit the ship. This had the effect of again sealing me up, and the old remedy (bleeding) was employed, as no one could pass an instrument. I suffered much until the end of the voyage, in November, 1837, and then went into Chatham hospital, under the

charge of Sir John Richardson, where I remained for six weeks with little or no relief, as nothing larger than No. 4 could be passed, and that produced very severe rigors at every attempt. Having learnt to use the bougie myself, I succeeded in keeping the passage open, until again, in the East Indies, in 1838, on board H.M.S. ——, it became so bad as to oblige me to return to England. In 1839 I sailed as —— Lieutenant of H.M.S. ——, for the South Pole; during this voyage, which lasted until September, 1843, I suffered very much, and was obliged to quit the expedition a few months before to come home. I could neither make nor retain my water, which was constantly dropping away, so as to keep my clothes wet, while the temperature was from 20° to 30° below the freezing point. On my return to England, I went under Mr. Guthrie, who succeeded in passing bougies up to No. 6, but no further. He then used a catheter with a lancet-blade, but with little benefit, as in a month afterward the passage was as much contracted as ever. I suffered severely from rigors during the time I was under Mr. Guthrie's care. Since then I have been three years upon the coast of Africa, and suffered so much from the disease, that upon two occasions lately I felt it necessary to decline the offer of service, knowing that, had I accepted, I should certainly have broken down."

Upon examination I found a slight contraction about three inches from the orifice, and a very tight stricture anterior to the bulb. Bougies were passed as usual up to No. 4, but then further dilatation was resisted, and as the patient had experienced no relief from the degree accomplished, I did not hesitate to divide the contracted part by external incision. For two days after the operation the patient felt perfectly well; but in the evening, after the catheter was taken out, he became suddenly so ill that I was sent for; I found him cold, nearly pulseless, and vomiting bilious fluid, in short, with every appearance of approaching dissolution. In the absence of other experience, these symptoms would doubtless have alarmed me; but knowing their true nature, I gave the confident assurance that all would be right in the course of a few hours. Accordingly, upon calling next forenoon, I found that the patient had breakfasted as usual, that his books were again in requisition, and that he was reading with a cheerful countenance. He made an excellent recovery, and at the end of a few weeks having received a letter from the Admiralty offering him the command of an expedition to the Arctic regions, at once accepted it. The stormy aspect of the political horizon delayed the necessary arrangements until too late for that season; but the patient's ready acceptance, after two refusals of a similar appointment, suffi-

ciently shows the change in his feelings which had been produced by the operation. Wishing to know his state at a later period, I wrote to him two years afterward, and received for reply that "he has not had a moment's uneasiness from the stricture."

Case VII.

Mr. ——, æt. twenty-seven, from his earliest recollection, had experienced undue irritability of the urinary organs, and deficiency of freedom in the urinary evacuation. In 1843 he went to the East Indies, and there suffered several attacks of gonorrhœa, which were followed by symptoms of stricture. In 1848, having returned home, he was exposed to severe cold while traveling in Ireland, and had retention of urine, which was relieved by warm baths and medicines, without the use of a catheter. Next year a fresh attack of gonorrhœa was followed by an aggravation of the symptoms of stricture, which led to a long trial of instruments and subsidiary measures without success. Being in the service of government, he then entered Haslar hospital at Portsmouth, where, between three and four months, to use his own expression, "innumerable attempts" were made with all sorts of rigid and flexible instruments, assisted by strict confinement to bed, repeated leeching and medical means, but all in vain, as, no more in the hospital than out of it, could the smallest bougie or catheter be passed through the stricture, which was in the usual situation, anterior to the bulb. The patient then came to Edinburgh and placed himself under my care, in August, 1850. At the very first attempt I passed a metallic bougie fairly into the bladder, and by the end of three weeks could introduce No. 10 without the slightest difficulty. He then went home, with instructions to have the instrument passed regularly.

Twelve months afterward this patient returned, complaining that the symptoms of stricture were as troublesome as ever, and stating that, as his services had been transferred to London, he was desirous of being rendered fit for duty without the risk of further interruption. I again passed some small bougies on two different occasions; but finding that although there was neither pain nor bleeding at the time, severe rigors were afterward experienced, and that the symptoms derived no alleviation, I advised the operation by external incision, and accordingly performed it as usual. Nothing occurred to impede recovery, so that by the end of three weeks the patient returned to London, in every respect perfectly well, and indeed making water with a degree of freedom which he had never known. Three years

afterward, wishing to learn the state of this gentleman, I requested my friend, Mr. Henry Thompson, to ascertain it for me, and received for reply, that No. 11 catheter passed with ease into the bladder.

This case shows that a stricture may be deemed impermeable without really being so, and will also, I hope, appear a convincing illustration of the advantages that may be derived from dividing by external incision a contraction of the urethra which resists the effect of dilatation.

Case VIII.

Captain —— began to suffer from stricture in 1822, when in the cavalry depot at Maidstone, soon after entering the army. The military surgeon could not pass any instrument; he repaired to London, and placed himself under the care of the late Mr. Earle, who, in the course of five or six months, after trying various plans, at length succeeded in dilating the canal to its full extent. The patient then went to the East Indies, and during the three years which he passed there, as well as after his return home, regularly introduced bougies. This, however, did not protect him from occasional attacks of retention, which required the catheter, and were observed to happen most frequently the day after he had passed the bougie. In 1838, finding that the disease was gaining ground, he applied to Mr. Guthrie, and remained under his care for a month, but without deriving any permanent advantage, so that it was necessary again to request his assistance in the same year, when the stricture was cut by internal incision. He then went to the West Indies, and continued to pass bougies regularly. In 1844 he married; in 1848 the disease assumed its formidable condition of extreme irritability. The calls to make water were almost incessant, and produced efforts so ineffectual that a small catheter was required to empty the bladder three or four times a day. Severe pains in the perineum and limbs prevented every sort of active exertion, while the state of suffering and oppression frequently required confinement to bed for weeks. The patient, at the end of two years passed in this miserable state, feeling thoroughly disabled for the enjoyments and duties of life, resolved to try the effect of my treatment. He accordingly came to Edinburgh in July, 1850, and as the case seemed very suitable for division of the stricture, I performed this operation without delay. The patient made a good recovery, and from that time forward has never had retention of urine, frequent calls to make water, pain or difficulty in doing so, or, in short, any of his former ailments. He enjoys the best of health, and is able to take the most active exertion. The bougie is still passed once a week by the

patient, but more as a precautionary measure than from any feeling of its being required.

This case shows that dilatation affords no security against the progress of a stricture, from its milder form to that of the most distressing character. It also affords an example of complete and permanent relief rom dividing the stricture by external incision, under circumstances which rendered any of the other means of treatment hitherto proposed utterly hopeless, and indeed inadmissible.

Case IX.

In the month of July, 1852, Mr. James Miller, Edinburgh, asked me to see a very distressing and perplexing case. The patient, Mr. ——, æt. forty-one, had begun to suffer from a stricture of the urethra thirteen years before, but paid little attention to it until the end of nine years, when about to be married. Mr. Miller then requested the assistance of Dr. Duncan, lately Senior Ordinary Surgeon of the Royal Infirmary, who soon succeeded in passing instruments, and at the end of little more than two months had fully dilated the canal. Twelve months after marriage the symptoms of stricture were again so troublesome that the aid of Dr. Duncan was requested, with the effect of again dilating the urethra so as to admit bougies of the largest size. But upon this occasion, instead of relief, there was an aggravation of the complaint. In November, 1851, the state of matters became so bad that from this time to May, 1852, the catheter was required twice a day for drawing off the water, the patient being confined not only to the house, but chiefly to bed; he then went to the country for some weeks, but returned without any improvement, and twelve months nearly having elapsed since he had been laid aside from the active duties of life, and rendered unable to take any charge of his business, though having every inducement and disposition to do so, he became very desirous to obtain some effectual relief.

In these circumstances, I found him lying in bed with an emaciated aspect, and care-worn, anxious countenance, expressive of suffering and apprehension, complaining of constant pain and uneasiness about the perineum, aggravated at every attempt to make water, which passed by small quantities, in drops, or in a slender stream. On examining the urethra, I found that a moderate-sized instrument, and even one of the full size, could be introduced, but not without encountering a little difficulty, and requiring some guidance at the seat of stricture, which was anterior to the bulb. According to the opinions hitherto entertained generally, so inconsiderable a degree of contrac-

tion would not have been deemed sufficient to account for symptoms so obstinate and severe. But having known complete and permanent relief afforded under similar circumstances, by external incision through the seat of stricture, I advised this mode of procedure, and carried it into effect with the most satisfactory result. The patient was at once entirely freed from all his uncomfortable feelings, quickly regained his health and strength, and ever since has been perfectly well. I have on several occasions, at distant intervals, passed a full-sized bougie, without the slightest catch or obstruction, and the patient finds it difficult to express his sense of obligation to the treatment by external incision, which so speedily transferred him from a bed of helpless and hopeless misery to the full enjoyment and usefulness of vigorous health.

This case illustrates the progressive disposition of stricture, and the inefficiency of dilatation either to prevent or to remedy the distressing symptoms which are occasionally presented by the disease. It also affords an example of the immediate, complete, and permanent relief which may be obtained, under such circumstances, from the external incision.

Case X.

Mr. ——, æt. twenty-three, applied to me in October, 1852. He stated that, from the earliest period within his recollection, he had experienced difficulty in making water, and particularly noticed this infirmity upon first going to school, from taking so much longer time than the other boys. At ten years of age he suffered from retention of urine, requiring the warm bath and confinement to bed. Next year he had a more severe attack, requiring the catheter, which one medical man failed and another succeeded in introducing. In every year subsequently, and generally about the autumnal season, he suffered from complete retention, while in the intervals he made water with great difficulty, in a very small stream. Indeed, from the age of fifteen, he said that it had always been necessary for him to empty the bladder in the same position as when evacuating the bowels, and then only through laborious efforts, aided by the pressure on the perineum at the seat of stricture, which was just below the scrotum. At length the suffering became so great and incessant, notwithstanding the use of small bougies, which indeed aggravated the symptoms, that he resolved to come from Canada to place himself under my care, and accordingly crossed the Atlantic for this purpose.

Feeling sure, from the history of this case, that effectual relief could be afforded only by complete division of the stricture, I administered

chloroform, passed a small grooved director through the contracted part of the canal, and divided it freely by external incision. The patient was at once relieved from the distress he had so long experienced, and in the course of a few weeks might have returned to America, had he not feared a relapse. I saw him after four months had elapsed since the introduction of any instrument, and passed No. 10 without the slightest difficulty, so that with ordinary care the recovery might be deemed permanent.

From this case, and others which have fallen under my observation, I am inclined to suspect that the occurrence of stricture before the age of puberty, and independently of sexual disease, is not so very rare as might be concluded, from the silence of surgical writers on the subject.

Case XI.

Lieutenant ——, of H.M. —— Regiment of Foot, in 1841 contracted a gonorrhœa, which was treated after a somewhat peculiar fashion, by the introduction of large bougies, and the cold shower-bath, with the effect of stricture being induced, and manifesting its presence by the usual symptoms, within the following eighteen months. He then went to India, and, during six years which he passed there, was under the care of five different medical men, who tried catgut bougies long and assiduously, without being able to pass them, and also caustic with little better success. In the course of these ineffectual attempts to afford relief his general health had become impaired, and in 1849 he was sent home, by the decision of a Medical Board. He arrived in England in March, 1850, and placed himself under the care of Mr. Quain, who, during the next eight months, passed bougies at first twice a week, and afterward irregularly, but, to use the patient's own words, "the stricture, like India-rubber, always went back to about the same size" (No. 3 or 4), and the scalding, from which he had never been free since 1841, continued. Next year his army surgeon passed instruments occasionally, without affording any benefit, and, toward the conclusion of it, finding the state of matters worse than ever, inasmuch as incontinence began to be experienced in addition to the difficulty of evacuation, he applied to Mr. Hancock, of London, and remained under his care from December to the following April, 1852. In the first instance no instrument could be passed, but caustic having been employed every two or three days for a month, under chloroform, No. 3 catheter was introduced, and retained in the bladder, and then Nos. 5, 7, 9, 11, and 12, with an interval of two days between each. Violent irritation suc-

ceeded the introduction of the last instrument, and prevented any other from being used for a fortnight, when No. 6 was passed with difficulty, and after a month or six weeks' further trial with bougies, No. 9 was the utmost extent that could be reached, while the symptoms remained unrelieved. The patient then rejoined his regiment, and had bougies introduced regularly without any benefit, up to the end of October, when the attacks of ague, from which he had long suffered occasionally, became nearly constant, so as to confine him entirely to bed. In these circumstances, the surgeon wrote to ask me if I would undertake the treatment of the case, and as I readily agreed to do so, the patient came over from Ireland, and arrived in Edinburgh on the 22d of December.

I found him lying in bed, much exhausted by his sufferings on the passage, and still laboring under one of the aguish attacks, from which he was seldom free; the urine was very turbid, and excessively loaded with mucus, which formed a large glairy mass at the bottom of the vessel containing it, and all the symptoms of stricture were present in an extreme degree. On the 24th, I divided the contraction by external incision, with some difficulty, from the excessive thickening and induration of the textures concerned, which resembled cartilage much more than the urethra in its ordinary state. After the operation there was no return of ague, or the slightest tendency to rigor, and in the course of a few hours the urine became clear and free from mucus. The catheter was removed at the end of two days, when a portion of the water escaped by the wound, but gradually diminished in quantity, and ceased entirely within a fortnight, when the patient might be considered, in every respect, as perfectly well. He had not been confined beyond three days to bed, and, instead of finding the time pass slowly, at a distance from his friends and occupation, declared that he never felt weary in enjoying the delightful sensation of relief from the scalding and other sorts of uneasiness which had been experienced, without intermission, for the last twelve years. On the 12th of January, as his regiment had been ordered to embark for foreign service, he departed for Cork, and there finding that sufficient time remained for the purpose, proceeded to London, and thence returned to Cork, in the midst of frost and snow, without ever having a bougie passed; there he engaged in all the fatigue and turmoil of departure, and sailed in a different transport from that which conveyed the regimental surgeon. This was, indeed, a severe ordeal for the operation, and, as it has stood the trial, the result is all the more satisfactory. But the case is important in another point of view, by showing the inefficacy of dilatation and caustic in the hands of gentlemen who,

from their position, must be supposed to have employed these means in the most perfect manner. It also shows the progressive nature of the symptoms, and the complete relief immediately afforded by division, in circumstances which, I believe, might have been justly deemed hopeless under any other mode of treatment.

Case XII.

In 1849, Mr. ——, æt. 60, applied to me on account of a stricture anterior to the bulb, from which he had suffered more than thirty years. During this long period Mr. Liston, and other practitioners, by the use of bougies, had palliated the symptoms, but never completely relieved them, and latterly they had become much more troublesome than ever. The urine was at all times passed with extreme difficulty in a small dribbling stream, or by drops, and the patient was so liable to retention that he never felt secure without having a slender flexible catheter in his pocket. I tried dilatation, but could not carry it beyond No. 4, and finding that the patient derived no benefit from this degree of improvement, proposed to divide the stricture by external incision, to which he readily assented. On the following day, after the catheter was removed, the urine resumed its natural channel, and flowed so freely that the patient felt at once completely free from all the annoyance and apprehension he had so long experienced. I desired him to call upon me occasionally to have a bougie passed, but this he neglected, and when he at length returned, in the course of the following year, I found that the contraction was re-established, so as to present the same symptoms and resistance to dilatation as before the operation. I therefore proposed to repeat it, and in doing so took care to divide the urethra much more freely than on the former occasion. Since then, during more than two years which elapsed before his death, from a different disease, there was no return of the disease, and every third or fourth month I passed a bougie of the full size without any difficulty.

This case shows the efficacy of division in subduing the resistance which is proof against dilatation, and also illustrates the advantage of making a free incision through the contracted part of the urethra, since had the second operation not been performed, it might, and no doubt would, have been said that in this instance the procedure had proved insufficient to afford permanent relief.

Case XIII.

In the beginning of January, 1850, Mr. Harvey of Lincoln requested me to take under my care a poor man who had suffered long from stricture, and had been rendered by it unable to do anything for the support of himself or family. He was accordingly admitted into the hospital on the 28th of that month.

The patient was 34 years of age, and had suffered from the disease for seven years, during the first three of which he had been under treatment by a dispensary surgeon, and derived some relief from passing instruments, which he found constantly necessary for allowing the urine to escape. He then went into the Lincoln Infirmary, and left it much in the same state, so that for the two following years he was unable for any employment; and although he constantly used a small instrument for keeping the passage open, occasionally suffered from retention even to the extent of 48 hours. At length extravasation of the urine took place into the scrotum, and he again entered the Lincoln Infirmary, when incisions were made, and at the end of a fortnight an operation was performed by cutting at the seat of stricture, and passing a catheter into the bladder for ten or fourteen days. After this he felt easy, he said, for a few days, but then felt it necessary to pass an instrument; and on leaving the hospital was provided with one, which he soon found too large, and therefore got a smaller one; that he continued to use four or five times a day during the next five months, when, being a burden on the parish, without any prospect of improvement, he was recommended to my care.

On the 30th of January I divided the stricture, which was anterior but close to the scrotum, by external means upon a grooved director. The patient experienced no bad consequences, and was dismissed perfectly free from complaint on the 28th of February. Having heard nothing of him since that time, I lately requested Mr. Harvey to ascertain his present condition, and received from that gentleman the following letter addressed to him:

Sheffield, November 20, 1854.

"Sir:—In reply to your letter, I have to inform you that I never had better health in my life than I enjoy at the present time, and that the stricture is quite removed. I have never felt anything from it since I underwent the operation.

"I remain, your obedient,

"J. D."

Case XIV.

T. E——, æt. 32, a seaman from Halifax, in Nova Scotia, of robust constitution, was admitted into the Royal Infirmary on the 9th of July, 1854. In 1839, he was standing on the bowsprit of the ship when the vessel made a heavy plunge, and his heel slipping he fell with great force upon his seat. He voided his urine with great pain for a day or two, and mixed at first with blood. He noticed that the stream of urine was diminished immediately after the accident, but it afterward became progressively less, and during the last twelve months he had made water only in drops, and had perpetual incontinence of urine. The stricture having proved impermeable to the surgeons of Halifax, whom he consulted, he was advised to cross the Atlantic and place himself under my care. On his admission into the hospital, micturition was extremely painful, and the most laborious efforts forced the urine away only in drops, while incontinence existed both night and day. There was a feeling of induration and irregularity about the bulb, which was the seat of a very tight stricture, complicated with a false passage, into which the bougie constantly tended to deviate, so that I found it impossible to introduce an instrument through the stricture. The same difficulty presented itself in all my subsequent attempts to pass bougies, and at the end of August he remained in the same state as on admission. As I had little doubt, however, that the difficulty arose from the form of the urethra where the false passage entered it, rather than from mere tightness of the stricture, I resolved to lay open the urethra on a director in front of the stricture, and then endeavor to guide the director through the stricture by means of my fore-finger introduced into the wound. For I had found, in a former case, that the tip of the index finger being inserted into the part of the urethra in front of the stricture as into a thimble, afforded the means of guiding on an instrument through the stricture with unexpected facility. Accordingly, on the 31st of August, the patient being under chloroform, I measured with a large bougie the distance of the stricture from the external orifice, and having introduced a director rather larger than No. 1 bougie for the same distance into the urethra, I pushed it in as far as it would go, and being thus sure that the end of the director was in the false passage, I made an incision in the middle line of the perineum, and laid open on the director the contiguous parts of the urethra and false passage. Having then introduced my finger into the wound, I succeeded in guiding the director through the stricture, and divided it in the usual manner by running the knife along the groove. I had now no diffi-

culty in passing a full-sized catheter into the bladder. The catheter was removed after 48 hours, the urine came for three days entirely by the wound, and then gradually resumed its natural channel, a large bougie being introduced occasionally. He left the Infirmary on the 13th of November, able to pass his water in a full stream, and in good general health.

Case XV.

J. N——, æt. thirty-seven, forester in the service of a baronet in one of the northern counties of Scotland, was recommended to my care by his master on account of a very distressing stricture, and entered the Royal Infirmary on the 8th of August, 1853. It appeared that when between fifteen and sixteen years of age, he had fallen from a height of eight feet, and felt unwell for several days. About three months afterward he began to experience difficulty in making water, which was voided in a small and turbid stream, and ever since had suffered in the same way. Various attempts had been made by different surgeons to pass instruments, but without success, during the last ten years.

Having, after several unsuccessful attempts, introduced a small bougie fairly into the bladder, I divided the stricture, which lay before the bulb, in the ordinary way, on the 12th of September, and the patient was dismissed quite well on the 24th of the same month. He continues to enjoy the most perfect health, and he lately sent me a message expressive of his gratitude for the speedy, complete, and lasting relief experienced from the operation.

Case XVI.

[For the following case I am indebted to Dr. Watson, who was the House-Surgeon of my late lamented friend, Dr. Mackenzie.]

J. R——, æt. forty-four, a fisherman, from Prestonpans, was admitted into the hospital on the 17th of March, 1852, on account of a stricture in the urethra of sixteen years' standing. Previously to admission he had been treated by bougies on various occasions, and under this mode of treatment had always suffered severely from rigors and febrile symptoms, without experiencing any benefit of longer duration than the period of dilatation. Latterly his symptoms had become more aggravated, and every attempt to pass instruments had proved ineffectual. A full-sized instrument was arrested at the bulb, and, not without considerable difficulty, a No. 1 bougie was introduced

into the bladder. The introduction of this instrument was followed by a severe rigor, and the next day the patient suffered from retention of urine, to relieve which a No. 1 catheter was introduced. Dr. Mackenzie made repeated attempts to continue the treatment by bougies, but the constitutional disturbance produced by them was so severe that he determined, without further delay, to divide the stricture. Accordingly, having introduced a grooved staff, the size of a No. 1 bougie, into the bladder, he made an incision in the middle line of the perineum, over the induration at the seat of stricture, and divided the contracted portion of the urethra to the extent of about three-quarters of an inch. A No. 8 catheter was passed with great facility into the bladder, and retained there, not more than half an ounce of blood being lost either during or after the operation. There was subsequently a slight degree of febrile disturbance, which subsided when the catheter was removed, at the end of forty-eight hours. During the following ten days the urine passed in nearly equal proportions by the urethra and the wound, but before the end of three weeks had entirely resumed the natural channel. He remained in the hospital a few weeks longer, during which a full-sized bougie was passed occasionally without the slightest difficulty, and was dismissed on the 12th of June. He was seen again on the 9th of June, 1853, when a No. 12 bougie was passed with ease; and the patient stated that, although he had been much exposed to cold and wet in deep-sea fishing, he had never experienced the slightest difficulty of micturition. In April, 1854, he applied for admission to the hospital on account of symptoms supposed to be rheumatic, but which were traced to aneurism of the innominata. He suffered from no urinary symptoms whatever, but was admitted on account of the aneurism, and died in the beginning of June.

The symphysis pubis, bladder, and urethra having been removed from the body, the symphysis was divided so as to allow the urethra and neck of the bladder to be laid open from above. A white depressed line of cicatrix, on the inner surface of the urethra, extending, in the mesial line, half an inch forward from the extremity of the bulb, corresponded exactly with the line of cicatrix in the integuments and intermediate textures. The urethra in this part was rather wider than natural, from having a slight funnel-shaped depression on the lower surface, and, before being opened, easily admitted a No. 12 bougie. In other respects the coats of the urethra presented a perfectly natural aspect, and the spongy tissue of the bulb, as well as the neighboring parts, were free from induration.

No one, looking at the urethra, which remained thus sound and ample at the part where it had been so long and tightly contracted,

although two years had elapsed since the operation without any means being used to prevent relapse, could entertain a reasonable doubt as to the recovery proving permanent, however long the patient might have lived; and such a result should stimulate our exertions to discover, so that they may be avoided, the errors of performance to which any recurrence of the symptoms that may have happened ought to be attributed, rather than to the principle of the operation.

APPENDIX.

RECLAMATION ADDRESSED BY MR. SYME TO THE IMPERIAL ACADEMY OF MEDICINE OF PARIS, RELATIVE TO THE REMARKS OF THAT BODY ON THE MODE OF TREATING OBSTINATE STRICTURES OF THE URETHRA.

EDINBURGH, 13th November, 1852.

MR. PRESIDENT, the Bulletin of the Academy of Medicine for the 12th of September last contains the report of your committee, appointed to decide upon the claims of candidates for the prize instituted by Monsieur d'Argenteuil for improvements in the treatment of urethral disease, and especially stricture. It is far from my wish or intention to question the justice of their decision. I was not a competitor, and am not affected by the result. But my name has been introduced into the report in such a way as to convey a most erroneous idea of the operation which I have devised for the remedy of obstinate strictures. And I feel persuaded that the members of the Academy of Medicine, when acquainted with the extent to which, however unintentionally, they have misrepresented my practice, will not hesitate to relieve it from a reproach that I hope to show is wholly unmerited.

The report states that my operation is more severe than that of Monsieur Reybard, since it requires division "of the whole thickness of the soft parts of the perineum," and characterizes it as an "extreme measure,"—the employment of which, by testifying to the urgency of the circumstances requiring relief, enhances the value of Monsieur Reybard's milder method. "I do not wish (says your reporter) to make any comparison between the urethrotomy of Mr. Syme and that of

our countryman. The two methods, indeed, are not to be compared with reference to their employment in practice." I have to beg that you will permit me to do what your committee have considered out of the question, and compare the two operations, in regard, 1st, to their performance; and 2d, to their effects.

The operation of M. Reybard is performed by introducing through the stricture a sheath containing a blade which may be expanded to any requisite extent by means of a central rod. But as such an apparatus could not be passed in cases of tight stricture, we are told that the patient must be prepared by dilatation sufficient to admit the "Urethrotome," and that if this method proves too slow or too painful, scarification of the contracted part is proper for accelerating the process. It is also said, that whatever be the form of the stricture, the incision ought always to be directed laterally, so as to avoid the artery of the bulb placed below. Now, this I affirm to be an anatomical error of the gravest consequences in practice, the arteries of the bulb being seated not below, but at the sides of the canal, and therefore endangered by any incision which is not strictly confined to the middle line corresponding with the raphe of the perineum. In the after-treatment of his incision, which, it is said, should be from five to six millimetres in depth and six centimetres in length, M. Reybard introduces into the urethra either a metallic dilator with expanding branches, or a bag expansible by mercury, and repeats this process every day for four or five weeks.

In my operation, a grooved director is passed through the stricture of such a size as is admitted without using force or causing pain or bleeding, and I maintain that there is no stricture whatever through which an instrument of this kind may not be passed. The patient's limbs being then held up, an incision about four centimetres in length is made exactly in the middle line of the perineum through the integuments and fascia. While the director is held in the left hand of the operator, the knife is guided over the fore-finger of his right hand so as to have its point inserted into the groove at the bulb, and is then carried forward completely through the strictured part of the canal. If the contraction be at any other part of the urethra, the process is conducted in the same way; but as it never exists any farther back than the bulbous portion, it is in no case necessary to cut, as your reporter says, the whole thickness of the soft parts of the perineum, or anything more than the integuments, fascia, and corpus spongiosum, which, being divided in the middle line, has the trunks of its arteries kept perfectly secure from injury, so as to prevent the possibility of hemorrhage. A moderate-sized silver catheter is retained in the bladder for

two days, and the only treatment afterward required is the occasional introduction of a full-sized bougie, at the distance of eight or ten days, or, at a later period, of as many weeks.

With regard to the effects of the two operations, it is necessary to remark that Mons. Reybard maintains all strictures to depend upon the formation of a new texture, which, in every case, essentially requires a free longitudinal division for effecting complete recovery; and also, that he considers urethrotomy inapplicable to the firm non-dilatable strictures which occur in old people, or those in bad health, for which he thinks palliative measures more expedient. It may hence be concluded, that in the class of cases subjected to operation by M. Reybard, the strictures were not of the most inveterate, obstinate, and unmanageable kind. Indeed, of all the seven cases particularly mentioned in the report as having been remedied by him, there is no allusion whatever to the duration of the disease, the unyieldingness of its character, or the failure of previous treatment. On the other hand, I maintain that strictures vary in their nature, some yielding to dilatation, others resisting it, and a third sort yielding to the bougie, but permitting no advantage to be derived from it in consequence of a resilient or contractile disposition, which almost immediately renews the symptoms. By means of the simple metallic bougie I have been accustomed to remedy all the ordinary forms in which the disease presents itself; and even in cases of twenty years' standing, or a still longer duration, should expect this method to prove successful as the general rule—the comparatively small number of those which, from their obstinacy, prove exceptions, being alone deemed proper subjects for my operation. Thus, there is at present under my care a patient who came from Montreal on purpose to have the operation performed, in consequence of prolonged and careful trials of the ordinary means having failed to afford relief. Almost all the cases in which I have operated possessed a similar character of obstinacy, and I have never declined interference on account of the age or health of the patient. In these circumstances, it could hardly be expected that the immediate effects of my operations should be less severe than those of M. Reybard. Yet it appears that in thirty-two cases operated upon by him, *one* patient died, while in sixty-six cases operated upon by me, *not one* died; that in his thirty-two cases hemorrhage occurred ten times, but in my sixty-six cases not once; and that in all of his cases bleeding continued for four or five days, while in mine it has never lasted beyond four or five hours.

I therefore contend that my operation is more simple, certain, and safe than M. Reybard's, and also more extensively applicable to that

class of cases which chiefly require its performance, from resisting other modes of treatment.

The quarter of a century has elapsed since Mr. Stafford, of London, proposed to remedy strictures by internal incision; and, ten years ago, I tried this method in a case which had resisted all the then known means of treatment. I cut the urethra no less freely than M. Reybard, by means of an instrument which, like his, consisted of a sheath containing a blade protruded at the side by a central rod—so freely indeed, that, without any subsequent dilatation, the largest instruments were passed with ease; but I found that the patient's relief was only of a few days' duration, and therefore concluded that the operation was not adequate to the remedy of the stricture in its most obstinate form. The same opinion is now, with hardly any exception, entertained in this country, from the results of ample and varied experience.

In conclusion, I beg to state, as the principles of my proposal:

1. That there is no stricture truly *impermeable*, and that with time and care, in every case, an instrument may be passed through it, and serve as a guide for the knife.

2. That all strictures which cannot be remedied by simple dilatation, admit of effectual relief only through a free division of the contracted part of the canal.

3. That this object can be obtained with certainty and safety only by an external incision, in a line corresponding with the raphe of the perineum, upon a grooved director passed through the stricture.

4. That the only after-treatment required is the introduction of a catheter during forty-eight hours, with the subsequent use of a full-sized bougie at distant intervals.

5. That the operation, if properly performed, is free from any risk whatever of hemorrhage, extravasation of urine, or fistulous opening.

I have the honor to be, Mr. President, your most obedient servant,

JAMES SYME.

PARIS, le 17th Novembre, 1852.

Le Secrétaire perpétuel de l'Académie, a Monsieur le Docteur James Syme, Professeur Royal de Clinique à l'Université d'Edinburg.

Monsièur,—L'Académie a reçu, dans sa Seance du 16th Novembre, 1852, votre note manuscrit, relative au traitement des rétrécissements de l'urètre, d'àprès une méthode qui vous est particulière.

J'ai l'honneur de vous prévenir que ce travail sera examiné, par une Commission composée de MM. Larrey et Robert.*

Agréez, Monsieur, l'assurance de ma considération très distinguée.

DUBOIS.

EDINBURGH, 4th April, 1853.

SIR:—I beg you will have the goodness to inform me if the committee to whom my reclamation was referred on the 16th of November last have reported on the subject. I have the honor to be, Sir, your most obedient servant,

JAMES SYME.†

M. DUBOIS.

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* M. Robert was the author of the report impugned.

† To this communication no answer has as yet been received.

EXTRACT FROM A CLINICAL LECTURE

ON

SOME POINTS OF PRACTICAL SURGERY.

DELIVERED TO THE

MEMBERS OF THE BRITISH MEDICAL ASSOCIATION.

THE next point to which I wish to direct your attention is, the remedy of obstinate strictures by external incision. There can be no doubt that dilatation, when practicable, affords the best means of treating strictures: but there are cases which, from their extreme tightness, render the process very tedious and difficult; others that are so irritable as to prevent the introduction of instruments; and a third sort have such a tendency to contraction that no permanent advantage can be obtained in this way.

I saw to-day a case which afforded a good example of dilatation being insufficient to afford relief. A gentleman from Devonshire applied to me, six years ago, under the following circumstances: After spending twenty years in the military service of the East India Company, he had gone to London, suffering from a stricture of long standing, and placed himself under the care of a late eminent surgeon, who tried dilatation in vain, and declared that he might, with an equal prospect of success, attempt to pass bougies through a deal board. The patient then inquiring what was to be his probable fate, received for reply, that with care he might be able to struggle on for five or six years; and upon expressing some disappointment that at the age of forty his prospect of life should be so brief and unsatisfactory, was told that he ought to consider himself fortunate, as many men did not live so long. Curiously enough, the patient did go on for six years, without further interference, but then found his existence so miserable, from frequent attacks of fever and retention of urine, that he resolved on applying to me.

I found a very tight stricture, but passed a bougie through it, and

completed the dilatation to its full extent without any interruption or the slightest disturbance, either local or constitutional. Colonel —— then went home, and remained well for a considerable period. He then began gradually to suffer from a return of the disease, and last year came back to me with the contraction no less tight than it had been originally. I again completed the dilating process, although not so readily or so free from feverish attacks as upon the former occasion, and was not much surprised to learn that very soon after going home he had again suffered from recurrence of the symptoms. He then happened to have business in London, and there applied to a practitioner who at present happens to occupy a prominent position. This person repeatedly tried in vain to pass instruments, and the patient therefore saw no prospect of relief except from another journey to Edinburgh. Now what was I to do in these circumstances? No doubt I could have dilated the passage again, but how long could the benefit so afforded be expected to last? and was it possible that this gentleman should every six weeks or two months perform a journey from Devonshire to Edinburgh? I felt it my duty to divide the stricture by external incision, and although a bougie has been introduced only once during the twelve months that have elapsed since he went home, I have to-day passed an instrument of moderate size into the bladder without any difficulty.

I may now show you another patient, whose case not only affords a good illustration of the advantage attending division, but is also of great interest in regard to the pathology of fistula in perineo. This man had suffered for many years from stricture, and managed to maintain evacuation of his urine by passing a bougie, but at length, laboring under complete retention, was admitted into the hospital, where we found that an abscess had formed in the perineum. I opened this abscess in the presence of my clinical pupils, and pointed out to them that the contents were entirely purulent, which they would not have been if the usual explanation were correct—that such collections result from infiltration of urine through ulceration of the urethra; at the same time explaining, as I have long been accustomed to do, that the stricture acts merely as a source of irritation; that the abscess in the first instance has no communication with the urethra; and that the fistula or passage for the urine is of secondary formation, through giving way of the septum between the abscess and the urinary passage. Accordingly in this case more than three weeks elapsed before the urine escaped by the fistulous opening, which we then endeavored to close by dilating the stricture; but although instruments of the full size were passed regularly every three or four days during seven weeks,

no improvement could be perceived. I then resolved to divide the stricture, and you now see that while the perineum is perfectly sound, an instrument of the largest size can be passed without encountering any obstruction in the urethra.

The object which I have chiefly in view at present is to explain a source of danger attending the operation that did not originally occur to me, and of which, indeed, I only lately became fully aware. In performing an operation upon the living body we are not in the condition of a blacksmith or carpenter, who understands precisely the qualities of the materials upon which he works, and can depend on their being always the same. The varieties of human constitution must always expose our proceedings to a degree of uncertainty, and render even the slightest liberties possibly productive of the most serious consequences; so that the extraction of a tooth, the opening of a vein, or the removal of a small tumor, has been known to prove fatal. Then it must be admitted that the most experienced, careful, and skillful operator may commit mistakes; and I am sure that there is no one of the gentlemen present who can look back on his practice and say he has never been guilty of an error. But, in estimating the value of any surgical procedure, we must beware of confounding the effect properly belonging to it with those that result from faults on the part of either the patient or the surgeon. Cases of the latter kind can never promote the improvement of our profession, or serve any higher object than supplying food for the morbid craving of ignorance and malevolence. It is therefore to the former that I wish to direct your attention.

It has been frequently and very incorrectly said that I maintain the possibility of passing instruments at the first attempt in every case of stricture. I never did so, although it is true that during thirty years' practice I have never found it necessary, either in public or in private, to puncture the bladder on account of retention of urine from stricture; but in many cases I have required repeated and careful trials before being able to pass a bougie through the contracted part, my maxim always being, that if the urine gets out, an instrument, through time, care, and patience, may be got in. If, indeed, the canal has become obliterated by the effect of external injury, the state of things is different, and then the ordinary procedure is no longer applicable. I communicated to the Medical and Chirurgical Society of London a mode of overcoming this difficulty, which seems much more eligible than the old plan of cutting on the point of an instrument at the seat of obstruction. It was to pass a curved director, with its groove upon the concave side, through the fistulous opening into the bladder, which

may always be very easily done, and then to push down upon it the instrument employed for guiding the incision in dividing strictures, so that the narrow portion of it is forced through the obstructing texture exactly in the proper course of the urethra, and thus conducts the knife with certainty in the proper direction. I had lately an opportunity of learning that one of the two cases mentioned in that communication remains perfectly sound and well. The young man now before you affords another example of this plan proving successful. He came from Halifax, in Yorkshire, on account of a fistula in perineo, through which every drop of his urine had passed for five months, since the receipt of an injury by falling astride on a beam of wood. On examination, I found the urethra completely obstructed, and therefore performed the operation just described, with the effect, in six weeks' time, of restoring him to his present state of comfort. He now passes his urine in a full stream entirely by the urethra, and is going home with the prospect, I trust, of enjoying good health.

In connection with this subject, I may notice a curious case that was lately sent to me by a gentleman now present, Dr. Roberts, of St. Asaph. The patient was a gentleman of about thirty-seven years of age, who had suffered long and severely from stricture, with fistula in perineo. In passing a small metallic bougie I felt a hard substance behind the contraction, and, from my recollection of a similar case, at once recognized it as a piece of bone. Without delay the stricture was divided, and these four small bodies removed. The largest has the size and form of a pea, the others being smaller and of an irregular figure. The largest one distinctly shows the osseous characters, but the smaller ones require a microscope for their detection. Urinary concretions are frequently met with behind a stricture, but exfoliations are hardly to be looked for in this situation, and can be accounted for on the present occasion only by the patient having in childhood suffered from disease of the pelvic bones.

TREATISE

ON THE

EXCISION OF DISEASED JOINTS.

PREFACE.

My object in offering this Treatise on the Excision of Joints to the profession is to call their attention to an operation which seems to have been unjustly neglected. When the arguments for and against it are carefully considered, the presumption appears strong in favor of the proposal; and when the results of its application in practice are examined, they leave no room for doubt that in many cases of frequent occurrence it might supersede the necessity of amputation. A prejudice has hitherto existed against the operation, which not only opposed its general introduction, but even prevented any inquiry into its merits.

Feeling assured that the removal of this prejudice would tend to raise the credit of surgery, and benefit a numerous class of patients, I have endeavored to give a general view of the considerations which seem to be of most importance in regard to the operation, hoping that they will thus produce a more deep and lasting impression than when dispersed and unconnected. Several gentlemen have been induced to perform excision since the publication in the Edinburgh Medical and Surgical Journal of some cases in which I practiced it; and I trust that the additional facts and arguments now submitted to the profession will persuade many more of its members to adopt the operation.

EXCISION OF JOINTS.

CHAPTER I.

OF THE DISEASES AND INJURIES OF THE JOINTS IN WHICH EXCISION MAY BE PERFORMED.

Owing to the improvements of modern surgery, more particularly in the treatment of aneurism, fractures, and necrosis, amputation of the extremities is now very seldom performed in civil practice, except in cases of disease or injury of the joints. The size and complicated structure of these parts expose them in a peculiar manner to disease, and render it extremely unmanageable when affecting them. Their synovial membrane cannot be wounded without the risk of intense inflammation and violent constitutional disturbance; and when altered in structure by diseased action, it is still more prone to inflame and suppurate, the consequences of which, though not so immediately dangerous to life, very frequently occasion the sacrifice of the limb. Their cartilage of articulation possesses little power of action either in health or disease; but it is apt to be detached from the bone, and then to keep up irritation by its presence; and the spongy osseous tissue which enters into their constitution, instead of dying and exfoliating like the dense texture of the shafts when inflamed, readily passes into the obstinate condition of caries. Another circumstance which greatly increases the frequency of disease in the joints is their disposition to suffer from the indirect irritation of constitutional disturbance, or, as it is expressed in common language, from disease fixing itself in a joint.

Though amputation is a measure very disagreeable both to the patient and to the surgeon, it has hitherto, with hardly any exception, been regarded as the only safe and efficient means for removing diseased joints which did not admit of recovery. The idea of cutting out merely the morbid parts, and leaving the sound portion of the limb, seems to have hardly ever occurred, or to have been met by so many objections that it was almost instantly abandoned. The serious

consequences of wounds accidentally or intentionally inflicted on sound joints gave this proposal the character of extreme rashness; and the unseemly as well as unserviceable condition of limbs in which anchylosis had occurred, afforded little encouragement to encounter the hazard of an operation, which seemed to promise this as its most favorable result. In order to decide how far these objections are valid, it is necessary to ascertain what cases require and admit the operation.

Of these by far the greatest number is presented by those affections of the joints which are comprehended under the general denomination of White-Swelling. Notwithstanding the accurate observations of Mr. Brodie, and the exertions of other modern pathologists, the precise seat and nature of these diseases at their commencement have not yet been satisfactorily ascertained; but the following facts, which are quite sufficient for the present purpose, do not admit of any question. Sometimes the synovial membrane is the part primarily affected, and, suffering a remarkable change from its usual structure, instead of being smooth, thin, and tough, becomes converted into a thick, soft, gelatinous mass, which exhibits no trace of its original appearance. Thus far the morbid process is attended with hardly any pain, or other inconvenience, except what proceeds from increased size or stiffness of the joint concerned. But, sooner or later, the symptoms of inflammation are perceived, the surface becomes red, pain is felt in the joint, and pressure or motion occasions much distress. Though there is great variety in the acuteness of these symptoms, from the slightest uneasiness to the most violent agony, they generally terminate in the same way, that is, in the formation of an abscess, which contains a thin sero-purulent fluid. It is not often that an opportunity occurs of laying open a joint at this stage of the disease; but I have had occasion to do so, and can verify the statement of Mr. Brodie, that even then the cartilages and part of the synovial membrane which covers them may be still, to all appearance, perfectly sound. If an opening is made naturally or artificially into this abscess, and its contents evacuated, a copious discharge, secreted by the morbid surface, continues to issue from it, until the patient's strength sinks under the weakening effect of the constant drain thus established, and the occasional attacks of inflammation which accompany it, or a cure is accomplished by anchylosis. When the disease is examined at the more advanced period, of which there is no want of opportunity, as this is one of the conditions in which amputation is most frequently performed, the synovial membrane does not display its gelatinous alteration so distinctly as before; it is collapsed, thinner, and, as it were,

wasted by the suppurative process. The articulating surfaces are rough and unequally covered with cartilage, which in some places is merely thinner than usual, in others ulcerated and discolored, and usually also detached in flakes of various size; while the cancellated structure of the bone is either exposed, or covered with a dark-colored fleshy growth.

In another description of cases, the cartilage seems to be the texture primarily affected. The patient complains from the first of pain, which is described as gnawing, deep-seated, and often confined to one particular point of the articulation; but, at the same time, he is often distressed with a pain shooting into distant parts of the limb, which generally becomes very weak, and sometimes altogether powerless. There is often considerable œdema of the limb below the joint affected; but at the seat of the disease the swelling is in general not very remarkable at first; it gradually increases, however, and though usually said to be distinguished by smaller size, more limited extent, and firmer consistence from the swelling which attends the gelatinous alteration of the synovial membrane, it can hardly, so far as I have observed, be thus characterized with any certainty. On the contrary, the swelling has appeared to me to show every variety of size and consistence, which is not surprising, since, though the thickening of the synovial membrane may exist independently, the form of white-swelling at present under consideration is almost always accompanied by more or less of it; and in both cases the enlargement of the joint is in a considerable degree owing to the thickening of the surrounding cellular substance, tendons, and ligaments. In this, as in the former disease, there is seldom an opportunity of examining the joint while the cavity remains entire; but sometimes the pain is so violent and unremitting, while the weakly frame of the patient is so little able to bear it, that the surgeon considers himself warranted to perform amputation; and then the following appearances are observed. The cartilage is of a dark color, and seems as if eroded; there is very little fluid in the joint, indeed, I have seen it altogether wanting; the synovial membrane, except at the part where the cartilage is destroyed, may remain little altered, but much more frequently it is thickened and changed by the gelatinous degeneration which has been already described. There is ground for believing, that, if this ulceration of the cartilage, as it is called, be arrested at an early stage of its progress, the parts affected may be restored completely to their natural state; but it much more frequently terminates in anchylosis or suppuration. In the latter case, amputation affords abundant opportunity of examining the morbid appearances, which, in their advanced stage,

are found to differ little from those observed in that form of the disease which originates in thickening of the synovial membrane.

There is still a third kind of disease comprehended under the title of White-Swelling, in which the bone is the tissue primarily affected. The symptoms are nearly the same as those which characterize the commencement of ulceration of the cartilage, viz. a deep-seated gnawing pain felt for some time previous to the appearance of swelling, with weakness and œdema of the limb. An abscess forms in the spongy extremity of the bone, and opens either on the external surface or into the joint. This affection is, for the most part, associated with thickening of the synovial membrane and ulceration of the cartilages, so that the appearances which present themselves on dissection after suppuration has taken place are nearly the same as those observed in the last stage of the other kinds of white-swelling. The most remarkable difference consists in the bone being more deeply affected; sometimes it is enlarged and hollowed out into a shell, constituting the *spina ventosa* of the old surgeons; and, at all events, instead of having merely its surface reduced to the carious state, it is hollowed out into a cavity which often contains fragments of dead bone, and exhibits the characters of caries over the whole extent of its interior.

The treatment of these different diseases may be divided into that which is proper before, and that which is required after suppuration. In respect to the first of these stages, it will be recollected that the symptoms are either acute or chronic. For the former, the abstraction of blood generally, and locally by leeches or cupping, is most suitable, while the chronic symptoms, generally speaking, are most under the control of counter-irritation. Blisters, warm plasters, and pressure are most useful in the chronic state of the thickening of the synovial membrane. The practice of applying pressure, together with some liniment to promote absorption, has been lately brought very prominently forward by Mr. Scott,* who, in his treatise, gives many cases of what he alleges to be perfect cures obtained by its means. Some of these cases must appear very surprising to every practical surgeon; and, though not inclined to go quite so far as Mr. Brodie,† who denies the possibility of recovery in this disease altogether, I must say that my experience would lead me to a very different opinion as to the facility of cure from that of Mr. Scott. As there can be no doubt, however, that nothing conduces more to retard the progress of the disease than rest conjoined with pressure, I should be sorry to oppose

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* Scott on Diseases of the Joints. London, 1828.

† Treatise on the Joints, p. 99.

myself to this plan of treatment; and to prevent an abuse of it, which I have frequently had occasion to regret, it would be well to recollect that it can be serviceable only when it does not occasion pain, since everything which does so must tend to strengthen and accelerate the morbid action. In the other forms of white-swelling, those, namely, in which the cartilages and bones are principally affected, there is no remedy so beneficial as the actual cautery. Issues may, it is true, be opened by other means, but by none so effectually as by this. There is a prejudice against the cautery, from its appearing a very severe remedy; but every one who has compared its effects with those of caustic, must admit that the pain occasioned by it is infinitely less prolonged, and perhaps hardly more severe, even during the instant of its application; and it is worthy of notice, that, though the use of the red-hot iron to effect counter-irritation was introduced here by myself, I have never been prevented from employing it by prejudice on the part of the patients.

In the second stage of the disease, that is to say, after matter is formed, it comes to be a question whether the surgeon should evacuate it, or wait for a natural opening. The objection to interfering is, that the case generally assumes a much more unpromising aspect when the abscess is opened; and it is difficult to prevent the patient or his friends from attaching some degree of blame to the practitioner, when he has hastened, or, as it may seem to them, has caused this disagreeable change by making an aperture. The objection, on the other hand, to waiting for the natural process, is, that the patient sometimes suffers great pain and an injurious extension of the abscess from delay. The safest course is to be guided by circumstances, and to make the opening in question only when it is indicated by the distress of the patient and the tension of the swelling. I have seen abscesses connected with disease of the vertebræ and hip-joint exist for years without occasioning the patient much inconvenience, but prove rapidly fatal on being opened.

The treatment at this stage consists of dilating the sinuses: applying metallic washes, such as the solutions of acetate of lead and sulphate of zinc; effecting moderate pressure on the joint; keeping the limb steady by means of splints; and supporting the patient's strength by nourishing food and exercise, so far as it can be accomplished without causing irritation by the motion. The chance of recovery varies very much with the age and strength of the patient; it is greatest in childhood; next in youth; and least of all in the adult age, at which time of life, indeed, there is hardly any to be expected. In very young children, again, if the exhaustion occasioned by the disease does not

prove too great for the strength of the patient, there is considerable prospect of a cure by anchylosis; and it appears daily from experience, however improbable and paradoxical the statement may seem, that the more unhealthy the individual is, especially if he is so much so as to be affected in more than one of his joints, the greater is his chance of recovery, provided he is able to undergo the process. The reason of this is probably the weakness of vital action in the osseous tissue of such subjects, which renders the spongy bones nearly as ready to die and exfoliate as the dense tissue of the shafts; and the diseased portions accordingly separate sometimes in masses of considerable size, but more frequently in small particles, which might easily pass without notice unless they were looked for. It is possible, also, that the diseased action or caries of the bone may not be quite so incorrigible at this early period of life as experience proves it to be at a more advanced age, and may therefore be cured without the death and exfoliation of the affected portion.

When white-swelling does not terminate in a spontaneous cure, it either remains obstinately in the same state for an indefinite period, or destroys the patient by exhausting his strength. In these circumstances, there are two modes of affording relief, viz., amputating the affected limb, and performing the operation which it is the object of this treatise to recommend; but before comparing the respective merits of these two procedures, it will be right to say a few words as to the other cases in which it is necessary to make a choice between them. These are, either the consequences of inflammation induced by injuries, or the immediate effects of external violence. In the former the state of parts differs little from that which has been already described as existing in the last stage of white-swelling. In the latter there is merely such an injury inflicted as experience leads us to consider incurable. The judgment to be formed in such cases depends so much on the particular joint concerned, that it is difficult to make any remarks of general application. I will therefore delay making any attempt to ascertain what injuries require immediate operation, as well as the mode of operating best suited to the occasion, until the excision of the joints in particular is considered, and will now proceed to compare the merits of this operation with those of amputation in the other cases that have been mentioned.

CHAPTER II.

OF EXCISION OF THE JOINTS AS A REMEDY IN WHITE-SWELLING, AND ITS MERITS IN COMPARISON WITH AMPUTATION.

THE advantages of amputation are, that it quickly, easily, and effectually removes the disease; but these are balanced by the serious objection of its depriving the patient of a limb; and, it may be added, that, though this operation cannot now be regarded as attended with much danger, it is certainly not by any means free from it. To say nothing of the ordinary bad consequences of amputation, I must here particularly notice the risk of inflammation and suppuration of the lungs, or other internal organs, which renders the result of amputation for caries so unsatisfactory, especially in hospitals. Every one who has attended the Hotel-Dieu must have remarked the frequency of death, or rather the rarity of recovery, after the removal of limbs in such circumstances; and though the evil seldom goes to such an extent in other places, I am sure all practical surgeons must be familiar with it. It is also observed that adult patients who have suffered amputation for caries often fall into bad health, and die of dropsy or some other chronic complaint within a year or two after the operation. These bad effects seem referable with most probability to the disturbance which is excited in the system by taking away a considerable part of the body; but, whatever be the true explanation of them, there can be no doubt as to the fact of their occurrence, which ought to be carefully remembered in making the comparison that is now attempted.

The great recommendation of excision is, that it saves the patient's limb; and the benefits accruing to him from this are so important and conspicuous, that, unless the objections which can be urged against it should appear after mature consideration to be very serious indeed, we ought not to hesitate in giving it the preference. These objections, so far as I have been able to ascertain, are the following: *First*, The difficulty of the operation. *Second*, Its danger. *Third*, The useless condition of the limb in which it has been performed.

In taking into consideration the difficulty of the operation, it must be ascertained, in the first place, what is requisite to constitute its effectual performance; in other words, how far it is necessary to take

away the diseased integuments, synovial membrane, articulating cartilage, and extremities of the bones. In cases of old standing, where the sinuses are numerous and the suppuration has been profuse, the integuments surrounding the joint often retain hardly any trace of their original appearance or structure. They lose their laxity and mobility, from effusion of lymph into the subjacent cellular substance; become smooth and shining on the surface, which is often of a dark-red or purple color; and are so soft that, if stitches are introduced to approximate the edges of an incision made in them, the threads instantly cut their way out. It might, therefore, be supposed that no healthy union or permanent cure could be obtained if parts in such a morbid state were allowed to remain, and that, consequently, the operation could very seldom be practiced with propriety. Experience, however, has shown that this is not the case; and that in a very few days after the operation, when the swelling and inflammation immediately consequent upon it begin to subside, the diseased integuments regain their natural characters and ultimately become perfectly sound.

As to the synovial membrane, Mr. Brodie has stated his opinion, that, when once its structure has been completely altered, it cannot be restored.* Independently of his high authority, it might be readily believed that, if any of the thick gelatinous substance into which this membrane is transformed were permitted to remain, a cure could hardly be accomplished; and that, as this portion of the articular apparatus is not only very extensive, but likewise most intimately connected with the surrounding tissues, it must consequently be next to impossible to perform the operation of excision effectually. Experience here also, however, has decided the matter to be otherwise; and it is proved beyond dispute, by the facts hereafter to be mentioned, that the synovial membrane, though thickened and gelatinized to the utmost, affords very little obstacle to recovery, since it speedily disappears, partly by sloughing, but chiefly through the absorbent action of its own vessels, during the copious suppuration which ensues.

With regard to the cartilage, it might be expected that no harm could result from leaving any part of it that remained sound; but here, too, the judgment of theory is reversed by experience, since it has been found that, when any portion of the articulating surface was left, the disease required a subsequent operation. The cause of this is probably to be referred, not so much to any morbid process in the cartilage itself, as in the synovial membrane lining it, and in the spongy bone immediately subjacent, which has its tendency to morbid

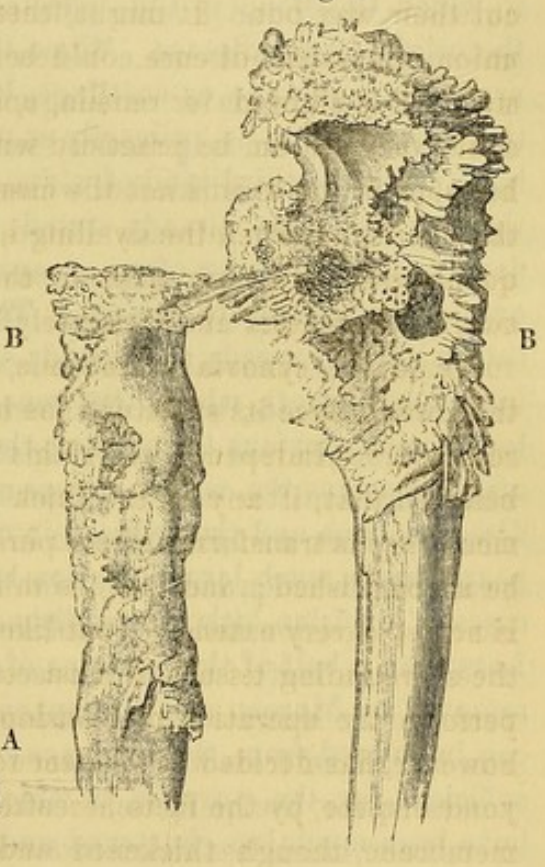
* Vid. Op. et loc. cit.

action excited by the injury sustained in its neighborhood. The operation, therefore, essentially requires the removal of the whole cartilaginous surface.

Lastly, as to the bone, one not acquainted with the pathology of the osseous tissue, who examined the bones of carious joints after maceration, might be apt to suppose that the diseased part could not be removed without sacrificing so large a portion of the whole as to render it useless and unworthy of preservation. Fig. 1 will illustrate

Fig. 1.

Fig. 2.



this. The bones represented here are those of an elbow-joint, which I amputated before adopting the plan of treatment now under consideration. It will be observed that they are much increased in thickness to a considerable distance from the articulation, and that their surface in the whole of this extent is covered with irregular warty excrescences, which give it a rough tubercular appearance. When these tubercles are examined more particularly, they are found to consist of a compact osseous substance, which is smooth on the surface, and perforated with numerous apertures for the transmission of blood-vessels. This is new bone, and perfectly healthy in its actions; it

resembles in all respects the callus, or new osseous substance, which effects the reparation of fractures, and is thrown out in consequence of the irritation of the disease. The truly morbid or carious portion of the bone is seen between the lines AA, Fig. 1, and BB, Fig. 2, occupying merely the articulating surfaces. The external shell of the spongy bone is here removed by the disease, and the cancelli are exposed to view, presenting a rough surface composed of rigid plates and spiculæ, which are white and more brittle than usual, so as to seem as if they had been subjected to the action of fire. The depth to which the bone is thus affected varies considerably, according to the origin of the disease. When the morbid action commences in the synovial membrane or cartilage, it is generally superficial; but when the inflammation is primarily seated in the substance of the spongy bone, as in the third kind of white-swelling which has been mentioned, then, as has been already stated, the substance of the bone is more deeply affected, being often excavated into a hollow, which is carious over the whole of its surface. The extent of this cavity seldom, or rather never, exceeds the bounds of the epiphyses, except sometimes in young subjects, where the bone has been widely altered by scrofulous action previous to suffering the inflammation which more immediately occasions the caries. From not distinguishing between the truly diseased bone and that effused in consequence of its irritation, it appears that a much larger portion has been taken away in some of the cases of excision hitherto published than there was any occasion for. Less than a half of the portions of the humerus and femur which were removed by Moreau and Crampton, I should certainly think, so far as can be judged from the evidence of their drawings, would have been sufficient for the purpose, in which case it is plain the limbs would have been much less shortened and weakened, and the magnitude and consequent severity of the operation diminished. As already stated, the caries seldom goes beyond the epiphyses, which are all the part of the bone that the surgeon requires to remove, except in the rare cases where the bone is found to be more extensively affected; and in these it will probably be most prudent to perform amputation.

From this analysis of the operation, it appears that all it essentially requires is the removal of the articulating epiphyses; and the next question that presents itself is, by what means is this to be accomplished? It is difficult to divide bones by means of a common saw, unless they are fairly exposed and held steady; and as these conditions can seldom be obtained in operating on the extremities forming a joint, various modifications of this instrument have been contrived for the purpose. Of these the most ingenious are the chain-saw of

Dr. Jeffrey, Machell's saw, and other kinds of rotatory saw; but it is quite unnecessary to enter into either any description of these instruments, or inquiry as to their respective merits; for they are all complicated in their structure, and perplexing in their application, when employed under the adverse circumstances of a deep situation, bleeding, and diseased soft parts, that obscure the bone, and the restlessness of a patient suffering a severe and protracted operation. Were it absolutely necessary in any case to use a saw for this purpose, I should certainly prefer the common one, believing it both much easier and much safer to expose the bone sufficiently for permitting its application by free incision, than to overcome the difficulties attending a less complete exposure by the mechanical contrivances in question. But fortunately we are not reduced to this disagreeable alternative, since the cutting-pliers which have been introduced into operative surgery with so much advantage by Mr. Liston, enable us to attain the object in view with perfect ease whenever the ordinary saw is not applicable. That there is no difficulty at all in the operation of excision, it would be absurd to affirm; and that in some joints, particularly in certain states of disease, it is extremely perplexing, I am ready to admit; but when the object to be gained is the saving of a limb, the trouble or difficulty of its attainment ought not to be considered an objection; and from what has been said, it will, I trust, appear that there is nothing required in this operation except what a moderate share of dexterity and coolness is sufficient to achieve.

The next question respects the danger of the operation. Here it ought, in the first place, to be recollected, that there is no parallel between a wound inflicted on a sound joint and that by means of which a carious articulation is cut out. In the former, unless the solution of continuity heals by the first intention, inflammation must necessarily supervene, when all the complicated, extensive, and irritable apparatus of articulation will be ready to suffer with its usual intensity and constitutional disturbance. In the latter case, the joint is already open, there being always one or more sinuses leading into it in the advanced stage of the disease which renders the operation of excision warrantable, so that the wound which the surgeon makes cannot, merely on account of exposing the cavity of the joint, be the cause of inflammation; and even though inflammation were to happen, its bad effects would be comparatively inconsiderable, since the structure which is so apt to be violently affected is removed by the operation. But this is not all; for the effect of cutting out the diseased parts is rather to allay than excite irritation, both by removing a source of constant gnawing pain, and at the same time freeing the limb most effect-

ually from tension. Hence patients have been observed to sleep better the night after the operation than for a long time previously. It also ought not to be forgotten, that the question here is, not whether the cutting out of diseased joints be attended with *any* danger, but whether this operation is more dangerous than amputation? and if, in addition to what has been said already, it be kept in mind that in excision the great nerves, arteries, and veins are not divided—that there is hardly any loss of blood—and that the system is not subjected to the disturbance which results from taking away a large part of the body at once, it seems to me not unreasonable to conclude that the danger is greater in amputation. But experience here too may assist in settling the point. I have cut out fourteen elbow-joints, and the operation has been performed in Edinburgh three times by other practitioners; of all these seventeen cases only two have terminated fatally; and in one of them the patient would, I believe, have died from any operation whatever, while in the other the disease was found so extensive as to render the excision almost impracticable. I believe the result of seventeen amputations in similarly unfavorable constitutions would not be so satisfactory. I am aware that some may think it unnecessary to prove that the risk attending excision is not greater than that of amputation, since the great advantage of saving the limb might be thought sufficient to counterbalance some additional risk; but I have no hesitation in declaring that, in such circumstances, I do not think a surgeon would be warranted in recommending the operation. The great object of medicine is the preservation of life, and the patient's mere convenience ought always to be reckoned a secondary consideration. Thus, if the fair induction from extensive experience should satisfy us that the limbs of ten persons laboring under diseased joints might be amputated with the probability of saving the lives of nine out of the whole, while excision of the joints would probably prove fatal to two, so that only eight would recover, though the condition of the eight would doubtless be preferable to that of the nine, I do not think this advantage ought to be regarded as sufficient to balance the life that would be lost. Having, however, as I hope, shown reason for thinking that the greater danger, generally speaking, proceeds from amputation, I will proceed to consider the last objection that has been alleged against excision, viz., that the limb thus preserved is useless, and not worth the pain or trouble required for its preservation.

It has been said that, after the joint is cut out, the bones must either unite together, so as to render the limb rigid and unserviceable, or, if it remain movable, the attachments of the muscles having been separated, it must be no less unfitted for use by its flaccidity and want of

subjection to voluntary motion. With regard to the first of these events, I think it cannot be denied that anchylosis of the shoulder or elbow, provided the other joints remained entire, so far from rendering the limb useless, would not prevent many of its usual actions, and certainly not to the extent of permitting it to be compared, in respect of utility, with an artificial substitute. But it has been ascertained by the sure decision of experience that true anchylosis or osseous union does not occur generally or even frequently in these circumstances; indeed, I feel authorized to say, not without very great attention on the part both of the surgeon and patient in favoring its accomplishment, particularly in preserving absolute rest; but when no such precautions are used, the union is established by means of a tough, flexible, ligamentous-like substance that permits the bones to be used with more or less freedom, according to the exercise which they are made to undergo during the process of healing. And the voluntary motion, though at first impaired or altogether lost, owing to the relaxation of the muscles, which is caused by the approximation of their attachments, necessarily resulting from the shortening of the bones, gradually returns, and ultimately becomes as strong as ever. What seems to occasion the greatest difficulty in conceiving the possibility of recovering voluntary power over the new joint, if joint it may be called, proceeds from inattention to the fact that muscles or tendons, when cut away from their attachments, fix themselves to the parts on which they come to rest. Thus the muscles of a stump adhere round the bone, so as to enable the patient to use it with force and freedom; and when amputation is performed through the tarsus, the *tibialis anticus* and extensors of the toes fix themselves so as to counteract the extensors of the heel. Independently of theory, however, we have here the more satisfactory assurance of positive facts; and the cases related below will, I trust, be considered sufficient evidence to show that it is possible to save limbs by excision of diseased joints, nearly, if not altogether, as useful as before they suffered from disease.

In addition to the arguments against excision which have now been considered, it has also been objected that the operation affords no assurance against a return of the disease; but as this objection applies equally to amputation, it need not be taken into account.

CHAPTER III.

METHOD OF PERFORMING EXCISION OF THE JOINTS.

HAVING now considered the objections which, so far as I know, have been urged against the operation of excision, I will next make some general observations on the mode of performing it, and the treatment to be followed subsequently. As the operation is painful and tedious, the patient ought to be placed in that position which most completely exposes the articulation, and can be preserved steadily with least inconvenience. I have never found it necessary to apply a tourniquet; but if the patient is very weak, and the surgeon is anxious to prevent the loss even of a small quantity of blood, there can be no objections to its application. The knife which seems to answer best for the requisite dissection is represented in Fig. 3. It is merely a long, narrow scalpel, straight in the back and very slightly convex in the edge, stoutly made, and having a small part of the back ground off obliquely at the point, so as to render it less apt to be broken, and bring it to correspond with the axis of the handle.

The preliminary incisions ought to be free, and so directed as to facilitate as much as possible the exposure and removal of the ends of the bones. In making them, the knife should be thrust at once into the joint, and afterward carried close down to the bones, which is much better than cutting by degrees, as it shortens the operation, lessens pain, and renders the line of direction of the incision more determined. It is always necessary, of course, to divide more or less of the muscular and tendinous parts; but they ought to be as little injured as possible, and the most effectual method of saving them is to cut them close away from their attachment.

It is impossible to form any idea of the kind of difficulty which is encountered in performing this operation on the living body from trials made on the dead subject where the parts are not diseased. The thickening and condensation of the cellular tissue, together with the gelatinous synovial membrane, which invests the articulating extremities of the bones and fills the space between them, throw many obstacles in the way of an unpracticed operator, by disguising the different tissues and matting them into one, so that the articulation requires as

it were to be carved out of a homogenous mass. The saw employed for removing the bones may be either a simple blade, as is represented in Fig. 4, or the one in common use for amputation, which is, I believe, on the whole, the most convenient for the purpose. For defending the soft parts while the bone is undergoing division, flexible copper spatulas have been recommended; but I have always found the hand a more convenient and effectual guard; and instead of cutting completely through, it is often better to divide the bone only partially with the saw, and then resort to the cutting-pliers, which readily detach the fragment so soon as there is a groove formed for the reception of their blades. Unless the bone is very large and hard, the pliers are of themselves sufficient for the purpose. It is worthy of notice, that the flat sides of the blades ought to be turned toward that surface of the bone which is to remain, as it will thus be less apt to be splintered or irregular. When all the diseased bone has been got away, which will be learned by a careful examination of the separated fragments and the remaining surface, if there are any large masses of gelatinous substance which can be easily detached, it is as well to remove them, since, though they would not afford any great obstacle to recovery, they might have some effect in retarding it, and also preventing the edges of the wound from coming readily together. Though the hemorrhage is generally pretty free in the first instance, it seldom persists so as to require the application of ligatures. The general oozing from the surface is usually soon checked by exposure to the air, or washing with cold water; but if, after the operation is ended, one or more arteries should continue to throw out a jet, they ought to be secured, as it is next to impossible to exert pressure with any effect, and considerable inconvenience is apt to result from the cavity becoming

Fig. 3.

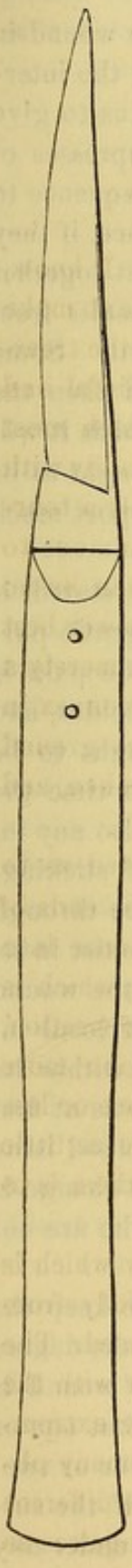
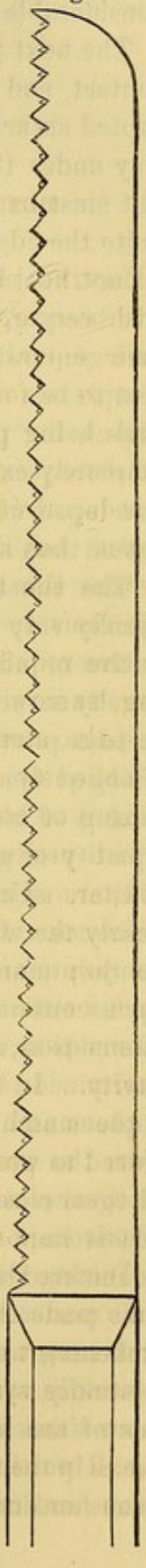


Fig. 4.



distended with blood. The vessels that prove obstinate are generally situated in the indurated subcutaneous cellular tissue, and require considerable care both for their discovery and ligature.

The next part of the process is to place the edges of the wound in contact, and retain them together, which is best effected by the interrupted suture, unless the integuments should be so very soft as to give way under the pressure of the threads, in which case compresses of lint must be used in their stead. It is always of most consequence to unite the edges of the transverse incision, if there is one, since, if they do not heal by the first intention, they are afterward brought together with very great difficulty, and the broad cicatrix which results from their separation is very adverse to the mobility of the joint. Some compresses of lint ought to be applied over the flaps, and then the limb being placed in a proper position, that, namely, in which it will most frequently be required after the cure is completed, it ought to be enveloped with a long roller, which affords the requisite support much better than splints or rigid cases of tin or pasteboard.

The constitutional disturbance, for the reasons already stated, is usually very slight, and requires nothing more than some gentle purgative or slight antimonial, with spare diet and rest. The pain is usually severe for the first five or six hours, but then subsides, and seldom proves troublesome afterward. The dressings ought to be changed ten or twelve hours after the operation, by which time the oozing of blood and serum will be at an end; and then also any inequality or gaping of the edges may be rectified by slips of sticking-plaster. Union by the first intention sometimes takes place through nearly the whole line of incision, except where old sinuses exist in its course; more frequently the adhesion is only partial, and the wound opens out more or less widely, according to the degree of local inflammation and the distention caused by blood contained within its cavity. In the course of a few days, the discharge, which was at first copious and offensive, begins to diminish; all the clots of blood issue from the wound; the swelling subsides; and the favorable change is altogether so sudden and satisfactory as to surprise those who are not accustomed to witness the operation.

During the cure, every means is to be employed either to keep the limb perfectly quiet, to favor anchylosis, or to exercise it in the degree and extent of mobility which will be required of it. The wound is generally very nearly healed in the course of a few weeks, but one or more sinuses continue to discharge for months, or even a year or two. Small portions of bone also occasionally come away; but if the surgeon has done his duty in the first instance, he need not be under any

apprehension on these accounts; and the patient will be too well pleased with being freed from the pain of his disease, and having regained the use of his limb, to feel annoyed by the trifling inconvenience which he thus experiences.

CHAPTER IV.

EXCISION OF THE SHOULDER-JOINT.

In proceeding to treat of the excision of the different joints in particular, I think it best to begin with that of the shoulder, because this was the one first subjected to the operation.

The shoulder-joint, like others of the ball and socket kind, is very little subject to disease originating in the synovial membrane; but inflammation of the bone, and subsequent caries of the articulating surfaces, are of more frequent occurrence. The disease is generally referred to some bruise or other external injury, and commences with deep-seated pain of the shoulder, which is more or less acute, and generally most severe at night; this pain is not confined to the joint, but shoots down the limb, and is particularly complained of about the elbow. The deltoid and other neighboring muscles are weak, or even powerless; they are also soft and relaxed, so that they seem smaller than usual, and hence give the shoulder a flattened appearance, which is increased by an œdematous swelling that generally exists in the lower part of the limb. If the actual cautery be used freely and early, and the best place for its application is, I believe, either the hollow at the posterior edge of the deltoid, or that between the deltoid and *pectoralis major*, it has a powerful effect in arresting the morbid action; but if the case is trusted to less efficacious remedies, or allowed to follow its own course without any interference, in process of time matter is formed, and the bones pass into the state of confirmed caries. The progress of the disease is generally slow, sometimes requiring years to arrive at its height; but it is not the less sure; and I have therefore been particular in describing it, as its comparative rarity and resemblance in some respects to ordinary cases of rheumatism render it apt to be overlooked, or treated with too little attention. When the abscess opens, it is not easy to reach the carious bone with a probe, owing to the tortuous course which the sinuses usually take;

and it has even been found impossible to do so, notwithstanding every care and the assistance derived from curving the instrument. In such cases, the history of the disease must be the surgeon's guide; and if he feels authorized to operate, he ought to commence so as to ascertain the true state of the parts without inflicting any more injury than is absolutely necessary, lest he should prove to have been mistaken.

There is no case in which excision is so decidedly preferable to amputation as caries of the shoulder-joint. The diseased bone can here be readily cut away without injury to any important organ, and the object gained is no less than the preservation of the whole superior extremity. When amputation, again, is performed, besides the severe loss which is sustained, there is a division of the large nerves and blood-vessels, and also the sudden removal of a large portion of the body, consequently a much greater risk of local and constitutional disturbance.

In 1768, Mr. White of Manchester treated a case, of which he gives the following relation:

"Edmund Pollit, of Sterling, near Cockey-Moor, in this county, aged fourteen, of a scrofulous habit of body, was admitted into the Manchester Infirmary, April 6, 1768. The account I received with him was, that he had been suddenly seized, about a *fortnight before*, with a violent inflammation in his left shoulder, which threatened a mortification, but at last terminated in a large abscess, which was opened with a lancet a few days before his admission. The orifice was situated near the axilla, upon the lower edge of the *pectoralis major*, and through it I could distinctly feel the head of the *os humeri*, totally divested of its bursal ligament. The matter, which was very offensive, and in great quantity, had made its way down to the middle of the humerus, and had likewise burst out at another orifice, just below the *processus acromion*, through which the head of the *os humeri* might easily be seen. The whole arm and hand were swelled to twice their natural size, and were entirely useless to him. He suffered much pain, and the absorption of the matter had brought on hectic symptoms, such as night sweats, diarrhœa, quick pulse, and loss of appetite, which had extremely emaciated him.

"In these very dangerous circumstances, there seemed to be no resource but from an operation. The common one in these cases, that of taking off the arm at the articulation with the scapula, appeared dreadful, both in the first instant and in its consequences. I therefore proposed the following operation, from which I expected many advantages, and performed it on the fourteenth of the same month I began my incision at that orifice which was situated just below the

processus acromion, and carried it down to the middle of the humerus, by which all the subjacent bone was brought into view. I then took hold of the patient's elbow, and easily forced the upper head of the humerus out of its socket, and brought it so entirely out of the wound that I readily grasped the whole head in my left hand, and held it there till I had sawn it off with a common amputation saw, having first applied a pasteboard card betwixt the bone and the skin. I had taken the precaution of placing an assistant, on whom I could depend, with a compress just above the clavicle, to stop the circulation in the artery, if I should have the misfortune to cut or lacerate it; but no accident of any kind happened, and the patient did not lose more than two ounces of blood, only a small artery which partly surrounds the joint being wounded, which was easily secured.

"He was remarkably easy after the operation, and rested well that night; the discharge diminished every day, the swelling gradually abated, his appetite returned, and all his hectic symptoms vanished. In about five or six weeks *I perceived the part from which the bone had been taken had acquired a considerable degree of firmness, and he was able to lift a pretty large weight in his hand. At the end of two months I found that a large piece of the whole substance of the bone that had been denuded by the matter, and afterward exposed to the air, was now ready to separate from the sound, and with a pair of forceps I easily removed it.* After this exfoliation the wound healed very fast, and on August 15, he was discharged perfectly cured. On comparing this arm with the other, *it is not quite an inch shorter; he has the perfect use of it*, and can not only elevate his arm to any height, but can likewise perform the rotatory motion as well as ever. The figure of the arm is noways altered, and from the use he has of it, and its appearance to the eye and to the touch, I think I may safely say the head, neck, and part of the body of the *os humeri* are actually regenerated.

"*I could not help being surprised to find so much strength and firmness, as evidently showed a regeneration of the bone, before the lower part had exfoliated, or even before it had begun to loosen. The osseous matter could not proceed from the scapula, the glenoid cavity of that bone not being divested of its cartilage; could it then possibly escape from the end of the sound bone before the morbid part had begun to separate from it?* Or are there any vessels that could convey the bony matter, and deposit it in the place of what had been removed?"*

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* Cases in Surgery, by Charles White. London, 1770, p. 57.

I have put some expressions in italics which seem to me of importance in explaining the true nature of this case. It is quite clear, from an attentive consideration of it, that it was not one of caries, but an instance of that acute necrosis which is so frequently met with in the finger, and occasionally also in the larger bones. (See first Quarterly Report of the Edinburgh Surgical Hospital, Ed. Med. and Surg. Journal, No. 101.) This will account for the facility of the operation and also its great success, particularly in respect to the length of the limb, which was not diminished. In all the other cases of excision which have hitherto been published, there was uniformly a degree of shortening proportioned to the extent of bone removed, yet, though nearly four inches were taken away by Mr. White, the limb was not perceptibly shortened. It may be asked how is the explanation easier on the one supposition than on the other? Why should new osseous matter be effused to repair the loss of substance caused by necrosis, and not after the excision of bone? These are difficult questions, and the only answer to them that I can offer is the well-known fact that there is a much greater disposition for the effusion of new bone in the one case than in the other. It is probable, too, that the foundation of a substitute may have been laid previously to the operation; —indeed, it is quite clear that this must have been the case with regard to the second portion removed by Mr. White. My reasons for giving such particular attention to this case are, *first*, because it led the way to all that has been done in this department of surgery; and *secondly*, because erroneous opinions regarding its real nature, arising from the superficial consideration of it, have rendered the result so difficult of belief as to throw an air of absurdity over the whole subject.

Soon after the publication of Mr. White's case, his example was followed by Mr. Bent of Newcastle,* and Mr. Orred of Chester.† It appears, from the accounts we have of these operations, that the disease for which they were performed was really caries of the shoulder, and that the patients retained limbs which, if not perfect, were at least extremely useful. Notwithstanding this encouragement to extend the practice, it seems to have been afterward treated in this country with entire neglect. In France, Moreau the elder performed the operation successfully in 1786, and the army surgeons, particularly Barons Percy and Larrey, frequently resorted to it on account of recent gunshot wounds instead of removing the limb. In civil practice, however, and for the cure of caries, I may say that excision of the shoulder-joint, until a few years ago, was never mentioned but

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* Philosoph. Trans., vol. lxiv. † Ibid. lxix.

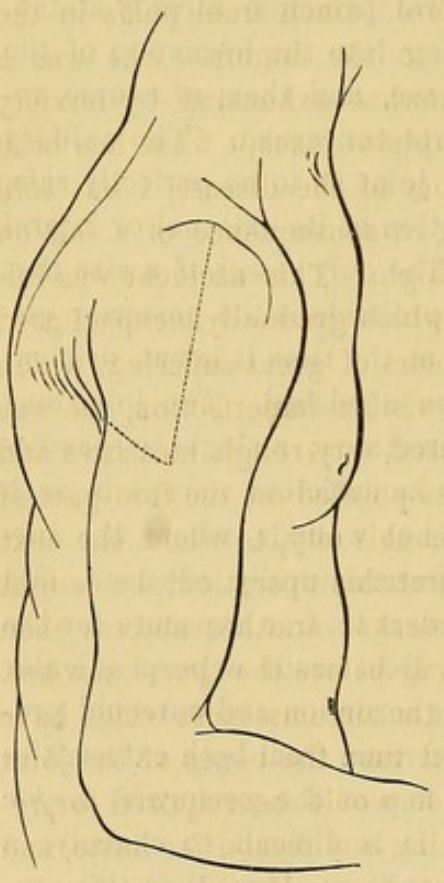
with ridicule and disapprobation. About five years ago I met with a case which afforded a very favorable opportunity of reviving this obsolete proposal, and carried it into effect with such success as confirmed me in the opinion of its advantages that I had previously been led to entertain. Before relating the particulars of this case, it will be proper to make some general observations on the mode of performing the operation in this situation.

The humerus is not always affected to the same extent, but the whole of its head, that is to say, all that part above the attachments of the *pectoralis major* and *latissimus dorsi* muscles, ought to be taken away; and this should be done in the first instance, to afford room for getting access to the scapular part of the disease. The glenoid cavity is sometimes affected only in a part of its surface, but the whole of it ought to be removed on the general principle already stated. The acromion process, though not entering into the formation of the joint, sometimes participates in the disease, and then, of course, requires removal no less than the other parts concerned. The axillary plexus lies at such a distance below the joint as to be perfectly safe, provided the surgeon opens the articulation at its external or lateral part, and then cuts close to the bones. The only vessel of a size that renders the necessity of a ligature at all probable is the posterior circumflex artery, which may be either tied at the time it is cut, or compressed by an assistant until the operation is finished. The joint may be opened by incisions made in various directions; a single perpendicular one from the acromion will hardly be sufficient, except in such cases as Mr. White's, or in recent gunshot wounds, where the surrounding parts are not thickened or preternaturally adherent, and where the comminution of the bone renders its free exposure for the application of a saw unnecessary. Mr. Bent made a perpendicular incision, commencing midway between the acromion and coracoid process, and then cut inward or toward the sternum from both extremities of this incision, so as to form an oblong flap of the *pectoralis major* and clavicular portion of the deltoid. It is difficult to conceive a plan of operating more dangerous to the axillary plexus than this one, or less favorable to the easy and effectual attainment of the objects in view. Sabatier proposed to extirpate a portion of the integuments and deltoid of a V shape, which, though not so objectionable in respect to its danger and inconvenience in the first instance, must be regarded as extremely adverse to a speedy and satisfactory cure. Moreau made a square flap of the deltoid, turned it down, and then gained what more room was required, by cutting upward at both extremities of the transverse incision, so as to obtain another flap. Mr.

Morel, in operating on account of a gunshot wound of the shoulder-joint, six months after it was received at the battle of Waterloo, made a semilunar incision with the convexity downward, so as to form at once a large flap from the deltoid. This mode of procedure does not appear to have been very convenient, if we may judge from what is stated by Mr. Morel as to the length of time required for the operation, which was no less than three-quarters of an hour, and the quantity of blood lost, viz., two pounds.*

I believe that the best way of bringing the bones completely within reach, with least injury to the soft parts, is to make a perpendicular incision from the acromion through the middle of the deltoid, nearly to its attachment, and then another shorter one upward and backward, from the lower extremity of the former, so as to divide the external part of the muscle. (See Fig. 5.) The flap thus formed being dissected off, the joint will be brought into view, and the capsular ligament, if still remaining, having been divided, the finger of the surgeon may be passed round the head of the bone, so as to feel the attachments of the spinati and subscapular muscles, which can then be readily divided by introducing the scalpel first on the one side and then on the other. After this the elbow being pulled across the forepart of the chest, the head of the humerus will be protruded, and may then be easily sawn off while grasped in the operator's left hand. The subsequent part of the operation will be conducted on the principles already explained, and, as it is of course desirable to preserve as much mobility as possible, no means should be used to restrain motion further than are necessary for preventing irritation and displacement. The *pectoralis major* and *latissimus dorsi* tend to draw the extremity of the bone inward; but this may be easily prevented by placing a cushion in the axilla.

Fig. 5.



* Med. Chirurg. Trans., vol. vii.

Case I.

Christian Laing, aged 38, was recommended to my care by Dr. Belfrage, of Slateford, in June, 1825. She complained of her left shoulder, the articulation of which was nearly immovable, though the perfect mobility of the scapula rendered this not very obvious. There was a small opening directly under the acromion about half way between this process and the humeral attachment of the deltoid, and another about the middle of the clavicular part of the *pectoralis major;* both of these openings allowed the probe to pass in the direction of the joint to a considerable depth. The discharge was thin and copious; the integuments were natural; and there was little swelling; the limb was entirely useless, being kept constantly suspended in a sling. The patient stated that she suffered much from pains in the shoulder, shooting down the arm even to the fingers. She was a healthy-looking woman, apparently somewhat exhausted by anxiety and suffering, but had no particular complaint, except what has been described. On inquiring into the history of the disease, I was told that it had commenced six years before, in consequence of a fall on the shoulder from a wall about two feet high. This accident was followed by pain and stiffness of the joint, which gradually incapacitated her for work; and at length, after five years of great suffering, which excited little sympathy, as there was no visible imperfection, she was induced to employ a bone-setter, who used very rough measures and aggravated her distress. A large abscess pointed on the fore part of the joint, and was opened by a surgeon in this city, to whom she next applied. On returning home to Roslin after this operation, she caught cold, and was confined to bed for six weeks; another abscess then formed, and opened spontaneously not long before the time I saw her.

From an attentive consideration of all the circumstances which have now been mentioned, I strongly suspected that the bones of the joint were diseased, and that a severe operation would be required for restoring the patient to health; but not seeing any reason for haste, and being averse to proceed rashly, I contented myself with dilating the sinuses and opening an abscess which had formed in the axilla. Soon after this her health became considerably impaired, and I advised her to return to the country.

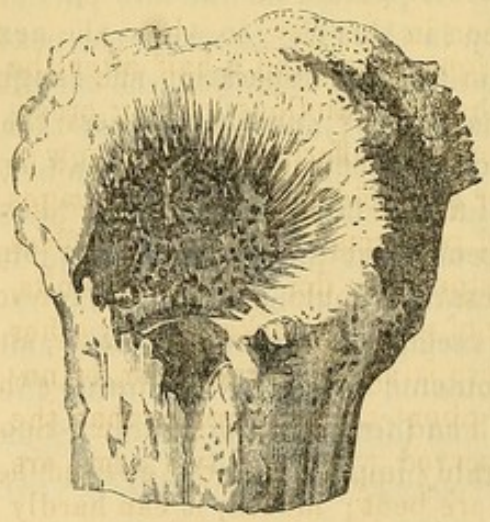
I saw nothing of the patient until the beginning of the following March. She then seemed to be much thinner and weaker than formerly, but the joint was little altered, except that there was another sinus just above the posterior margin of the axilla, resulting from an abscess that had been opened in the Royal Infirmary, whence she had

been discharged two months before, after a residence of several weeks. She now suffered more than ever from an almost incessant gnawing pain; slept ill; had little appetite; and found herself becoming every day weaker, owing to an exhausting diarrhœa.

Though it was still impossible to pass a probe through any of the sinuses to the bone, and though no crepitus could be perceived when the joint was made to undergo the slight degree of motion which it still possessed, I now felt fully satisfied that nothing but an operation afforded any chance of relief, and therefore proposed to cut down upon the joint so as to ascertain its actual condition; after which the diseased bone might be removed, either alone, if practicable, or together with the limb, if circumstances should render this necessary. The late Dr. Dease, who was then surgeon to the forces in North Britain, having examined the patient, formed the same opinion, and gave me his assistance at the operation, which was performed on the 1st of April.

The patient being seated in a chair, I made a perpendicular incision from the acromion through the middle of the deltoid, nearly to its insertion, by thrusting the knife at once to the bone, and then carrying it downward at the same depth. By introducing my finger into the opening thus made, I felt that the head of the humerus was hollowed into a cavity, and therefore determined to cut it out. With this view, I cut upward and backward from the lower end of the first incision, and having dissected the flap thus formed, so as to expose the joint, detached the scapular muscles from their connections with the tuberosities. When the arm was now carried forward across the chest, I easily made the head of the humerus protrude, grasping it in my left hand, and sawed it off without any injury to the soft parts. (Fig. 6.) I next examined the glenoid cavity, which seemed to be sound, though divested of its cartilage. The coracoid process appeared to be unaltered; but as the extremity of the acromion was bare and rough, I removed the affected portion by means of the cutting-pliers.

Fig. 6.



The first incision was followed by a considerable gush of blood; but the only artery divided of such consequence as to require a ligature

was the posterior circumflex, which Dr. Dease compressed with his fingers till the operation was finished. This vessel was then tied. Five or six sutures were introduced to keep the edges of the wound together, and some compresses of lint were secured by a spica bandage.

The whole operation, including the dressing, occupied ten minutes. The patient bore it well, and lost very little blood. She passed a quiet day, and had a good night.

On the second day after the operation there was a slight attack of erysipelas, for which she had fourteen ounces of blood taken from the arm, and used a weak antimonial mixture. On the fourth day the erysipelas was declining. The edges of the wound were generally adhering; but at the site of the old sinus below the acromion, there issued a dark-colored, profuse, and fetid discharge. On the fifth day, there was a sudden and rather alarming sinking of her strength, from which she readily recovered, under the influence of wine and beef-tea. After this the cure went on steadily and rapidly; so that in a few weeks the wound was entirely healed, except those parts of it which corresponded with the openings of the sinuses that previously existed; and she was able to go about free from the former pain and exhausting discharge of matter. The use of the limb returned gradually, and, though serviceable to her almost from the first, that is to say, a month or two after the operation, it has been gradually becoming more and more so ever since. The sinuses dried up by degrees, and one of them continued to afford a few drops of serous exudation for nearly two years.

She is now in the following state, four years and a half after the operation: Instead of being a thin, exhausted, anxious-looking creature, who seemed about to sink under her sufferings, she is now a stout, active, young-looking woman for her time of life. She manages the whole of her domestic concerns, and performs all the manual offices which the wife of a tradesman is accustomed to do. She sews, knits, and washes. She carries a full pitcher of water, a basket, or any other ordinary load, with the left arm. There is no discharge, pain, or uneasiness of any sort. The left arm is about an inch shorter than the right; a difference which is best observed when the two arms are viewed from behind while the elbows are bent; indeed, it can hardly be remarked in any other position. When the shoulder is examined without any covering, it exhibits a very deep, irregular, unseemly cicatrix, owing to the great increase which has taken place in the subcutaneous adipose tissue since the operation.

The joint, if it may be so called, allows the limb to be moved in all directions to nearly the natural extent, but her voluntary command

over it is much more limited. She can move it across the chest, both forward and backward, with considerable force and freedom, but she has very little power of abduction; this, however, gives her very little inconvenience, as, when she wishes to separate the arm from the side, she easily does so with the assistance of her left hand. The result of this case far exceeded my expectations, and afforded great encouragement to persevere in the practice.

Case II.

Charles Borthwick, aged forty, a mason by trade, applied to me in May, 1826, on account of a disease in the left shoulder, in many respects bearing a strong resemblance to the one that has just been described. There were several sinuses opening about the margin of the axilla and all running toward the joint, though one only allowed a probe to reach the bone; there was little, if any, mobility of the articulation; and there was great wasting of the deltoid muscle, from which circumstance the bones appeared more distinct and larger than usual. The patient's pulse and appetite were good; but he was very thin and exhausted-looking, and suffered from an almost constant cough, which was particularly troublesome at night.

He stated that between four and five years ago, till which time he had been a remarkably strong and healthy man, he suddenly felt, during the cold weather of winter, a severe pain in the left shoulder, which immediately rendered him incapable of moving the joint. Soon afterward the integuments became red and swelled; and in the course of a year several abscesses formed about the joint, which, when opened, did not heal, but continued to pour out a thin and copious discharge. He had recourse to various practitioners, who prescribed injections and pressure; but as these means were employed without any benefit, he determined to let things take their own course, and had accordingly done so for two years before the time I saw him. During the last six months his strength, which till then had been little affected, began to give way; and at the same time his cough also commenced. An aggravation of the pain, from which he had never been altogether free, induced him to apply to me.

Although I much feared that the period for an effectual operation had been allowed to go by, I felt very unwilling to leave him to the certain destruction of his complaint, which threatened to be very speedy, and therefore determined to try what effect a change of air and diet would have in restoring his health. With this view I sent him out of town, where he had everything that could be desired in

respect to diet and attendance. A remarkable improvement was soon manifest in his appetite, strength, and general appearance. The cough continued, but seemed to depend in a great measure on irritation, as it regularly kept pace with the pain in the shoulder. His respiration was performed naturally, and the stethoscope afforded my friends, who examined his chest by its means, no reason to forbid the operation. In the course of four or five weeks, the patient becoming very anxious for relief, I began to think seriously of operating, and proceeded to do so on the 11th July.

Having brought the head of the bone into view by means of incisions similar to those described in Christian Laing's case, I attempted to detach it from the scapula, but, in effecting this, experienced considerable difficulty from ligamentous anchylosis of the joint; the muscles, too, were very rigid, and the long head of the biceps was attached to the humerus, between the tuberosities. Having, at length, divided all the connections, I turned out the head of the bone and sawed it off. On examining the state of the scapula, where we were prepared to expect disease, I ascertained that the root of the coracoid process, and upper part of the glenoid cavity, were carious. After making a very free removal of the diseased bone by means of cutting-pliers, I secured the posterior circumflex artery, put two stitches in the transverse part of the wound, filled the cavity with caddis, and then fixed the limb with a sling and a single turn of a roller.

Notwithstanding the pain and tediousness of this operation, which, together with the dressing, lasted twenty minutes, the patient never had a bad symptom, and was walking about at the end of a week. The wound suppurated most favorably, and a great many fragments of bone came away, so as to leave the surface uniformly covered with firm healthy granulations. It is needless to detail particularly the future progress of the case; it may be sufficient to state, that the cavity gradually contracted, and in the course of six weeks was nearly healed. After that time the improvement was not so rapid, and an old sinus which ran along the *fossa supra spinata* under the trapezius rather became larger; I could not, however, discover any diseased bone, and trusted that the progress, though slow, would ultimately terminate in recovery. His pectoral complaints, however, became more troublesome, and he died about six months after the operation, when his lungs were found on dissection to have been almost entirely destroyed by suppuration. The extremity of the humerus was rounded off and connected to the scapula by strong ligamentous bands.

The result of this case cannot be regarded as unfavorable to the operation; on the contrary, it shows with how little constitutional

disturbance excision of the shoulder-joint may be performed even in the most unfavorable circumstances; and there can be little doubt, that, had this patient undergone the operation before the irritation of the disease had affected his lungs, his recovery would have been no less complete than that of Christian Laing.

CHAPTER V.

EXCISION OF THE ELBOW-JOINT.

The difficulties which attend the removal of carious bones from the elbow-joint are considerably greater than those encountered in operating on the shoulder, owing to the number and form of the articulating surfaces and their strong ligamentous connections, while the objection to amputation, so far as regards its danger, is of much less weight. The proposal of cutting out the elbow-joint has accordingly proved even still more unpopular than that of excision of the shoulder; and until a few years ago, the only instances on record of its actual performance were those related by Moreau, though their successful issue might have been expected to overcome the prejudices of other surgeons against the operation, and, as it were, force them to adopt it. The original idea of this operation proceeded from Mr. Park of Liverpool, who tried it on the dead subject, but, for what reason does not appear, never applied it in practice. The two Moreaus, however, adopted it in good earnest, and employed it at Bar-sur-Ornain with great success. Three of their cases are detailed in the treatise of Moreau Junior, and two others are simply mentioned by him, in which the result was equally satisfactory, but the patients being young ladies, the particulars are not related.

Considering the great frequency of caries in the elbow, and the severe operation which is commonly resorted to for its removal, viz., amputation of the arm, the apathy of the profession to these facts seems very extraordinary. During the present century, in which so much has been done toward the improvement of surgery, hardly any attention has been given to this subject; I am not aware, indeed, that the records of our profession contain even a single instance of the operation being performed in Great Britain previously to the cases which will be found below.

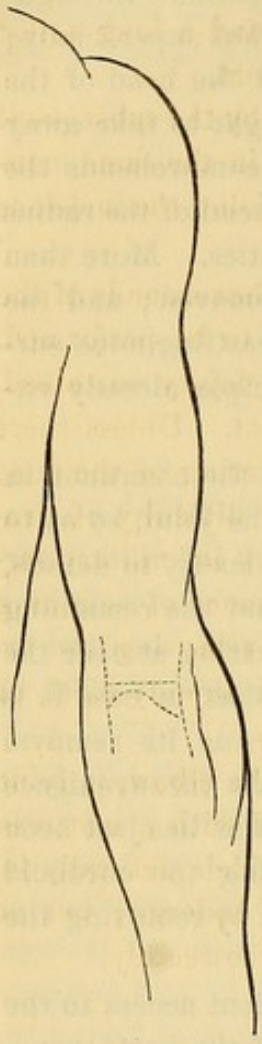
The elbow-joint may require excision for caries, and also for the effects of external injury, both primary and secondary. The part of the articulation that usually suffers most from caries is the olecranon, which is not unfrequently hollowed into a cavity and diseased throughout; the radius and humerus are in general affected but superficially; and the disease very seldom, if ever, extends beyond the head of the former and tuberosities of the latter. It is always right to take away the whole of the sigmoid cavity of the ulna, which comprehends the olecranon and coronoid processes, together with the head of the radius and extremity of the humerus as high as its tuberosities. More than this, for the reason just mentioned, need not be removed; and the smaller portion would not include the whole of the cartilaginous surface, none of which, according to the general principle already explained, ought ever to be allowed to remain.

The easiest way of accomplishing this is to remove the olecranon in the first place; then to cut the lateral ligaments of the joint, so as to free the extremity of the humerus, and saw it off; lastly, to detach, by means of cutting-pliers, the head of the radius, and the remaining part of the sigmoid cavity. The reason for not separating at once the whole of the ulna that requires to be removed is, that, in case it is divided below the insertion of the *brachiæus internus*, its removal becomes extremely difficult. Having experienced this inconvenience in one of my first cases, I have since always proceeded as has just been described, and never found any difficulty in detaching the coronoid process after gaining the free space that was afforded by removing the olecranon.

A simple longitudinal incision will not give sufficient access to the joint to allow of its excision, even in a sound state of the parts, much less when they are thickened and preternaturally adherent, as in cases of caries. An additional transverse cut was therefore proposed by Mr. Park, intersecting the other at right angles; but this plan labors under the double objection of splitting the triceps, and not permitting free exposure of the humerus. A method still more objectionable, on the ground of unnecessarily injuring the muscles, is to make a longitudinal incision, and two transverse ones at its extremities, so as to form two lateral flaps. By far the best plan that has yet been contrived is that of Moreau; and though it may appear at first sight complicated and destructive to the soft parts, it is really the easiest and least injurious that can be imagined. The dotted line H, on Fig. 7, gives a perfect idea of his incisions; and it is only necessary to state further, in explanation of them, that the transverse one should be close above the olecranon. In making this cut the ulnar nerve is apt

to be wounded or divided; and though the facts mentioned below make this injury appear of very little consequence, as there can be no advantage in inflicting it, the surgeon ought to use the precaution of ascertaining the situation of the nerve before introducing his knife. The thickening of the limb is sometimes not so great as to prevent the nerve from being felt, but more frequently its situation can be discovered only by recollecting its position relatively to the bones; it lies close to the inner edge of the olecranon, and will certainly be cut if the transverse incision is prolonged farther than this toward the internal tuberosity of the humerus. The surgeon, therefore, ought to feel for the olecranon, and introduce his knife close to its upper surface, with the back turned toward its inner margin, but somewhat nearer its radial side. Having thrust the knife down into the joint, he ought to cut transversely, with a sawing motion, so as to insure the division of the tough tendinous parts, until he arrives at the radial tuberosity of the humerus. He may then make the longitudinal incisions, which should extend about an inch and a half upward and downward, without any danger whatever, as the oblique course of the nerve recedes from the line of division. Both flaps should be dissected previously to commencing the excision of the bones, as it is thus rendered much easier than when the exposure is confined to the part that is to be first removed. The hemorrhage is generally profuse immediately on the incisions being made, but soon diminishes, and seldom persists to such an extent as to require the application of a ligature; on the principle already stated, however, it is right to secure any vessel, however small, that threatens to continue to bleed. In those rare and perplexing cases where the ulna is diseased below the coronoid process, and requires to be divided through its shaft, the interosseous artery is very apt to be divided, and must, of course, be tied. As to the humeral artery, it is always perfectly safe, being protected from injury by the whole thickness of the *brachialis internus*.

Fig. 7.



There is a great variety in the difficulty which is experienced in performing this operation in different cases. The adhesions are sometimes so general and so firm that no way can be made without the

knife; while, at other times, the suppuration has, as it were, already dissected the bones, so that the surgeon, after making his incisions, has little to do but to apply his saw and pliers for their removal. When the operation is concluded, the edges of the wound are to be stitched together; the limb ought to be half bent, and a long roller applied in the figure of eight to give it proper support.

In cases of wounds where caries has been induced by the subsequent inflammation, the operation ought to be conducted in the same manner, except that, if there is a large opening into the joint, the incisions ought to be directed so as to take advantage of it.

In recent cases of compound dislocation, and gunshot wounds of the joint, the surgeon must decide as to the operation to be performed, from a general and attentive consideration of the injury sustained, and the care that can be bestowed on the treatment. Unless there be a wound of the great vessels and nerves, a splintering of the bone high up, a very unfavorable state of the system, or difficulty of procuring the requisite attention, as sometimes happens in military service, he will be warranted in giving his patient a chance of retaining the limb, by abstracting the broken fragments and removing the articulating surfaces, either through the openings that already exist, or a suitable extension of them.

The best position for the patient, in cutting out the elbow, is lying with his face downward on a sofa or table covered with a mattress. It is disagreeable to place him in this posture, which naturally increases his dread of the sufferings he is about to undergo; but no other will enable the surgeon to command the joint so readily.

Case III.

Mr. Y., twenty-four years of age, about fourteen months before asking my assistance, began to feel flying pains in the left elbow-joint. He could not in any way account for the origin of this complaint, and paid little attention to it, until after the lapse of several months it became gradually much aggravated, and accompanied by a weakness of the limb, which at length deprived him of its use. The joint being now considerably swelled, was leeched, but without any relief. Poultices were then applied for several weeks, when the practitioner in attendance made an incision over the inner tuberosity of the humerus, and evacuated a large quantity of matter. Other incisions were subsequently made in different parts of the arm for the same purpose. Though somewhat relieved after the discharge of these abscesses, he still continued to be tortured with pain, which was particularly severe

during the night, when it not only deprived him of rest, but almost made him distracted.

I saw him first in October, 1828, and found his strength, as well as appetite, less impaired than might have been expected. His countenance, however, betrayed intense and long-continued suffering, and exhibited very remarkably that peculiar anxious look which so often accompanies disease of the bones. The limb was perfectly powerless, and œdematous from the lower third of the humerus downward. After several unsuccessful trials, I succeeded in passing a probe into the posterior part of the joint, which was then felt to be extensively carious.

As the disease appeared to be confined to the bones, as the patient was young, and as the irritation of the disease was much greater than any that could result from an operation which had the effect of removing the source of it, I resolved to cut out the joint, and accordingly performed the operation on the 3d of November, in the presence of Professor Russell and Sir George Ballingall.

Having placed the patient on a sofa so as to present the elbow in a favorable position, I made a transverse incision at once into the joint immediately above the olecranon, and extending to the radial tuberosity of the humerus, but at such a distance from the inner one as to avoid the ulnar nerve. I then cut upward and downward for about an inch and a half at each extremity of the first incision, so as to form two square flaps, which being dissected from the subjacent bones, exposed them completely. Having ascertained that the ulna was carious as far as the coronoid process, I sawed it across at this part, and then insulating the extremity of the humerus, divided it in the same way immediately above the tuberosities. I lastly removed the head of the radius, which was very much diseased.

No vessel required a ligature, but there was a considerable general oozing from the cut surface. After exposing the wound for a few minutes, and sponging it with cold water, I brought the flaps together, and retained them in contact by means of one stitch in each of the perpendicular incisions and three in the transverse one. Some compresses of lint and a roller were then applied, after which the patient was put to bed. Those present were much struck by the very slight alteration that appeared in the shape of the limb after the stitches were introduced.

On the following morning, I found that the patient had passed an indifferent night, and was looking rather anxious and exhausted from want of sleep, notwithstanding an opiate which he had taken the preceding evening. His pulse, however, was good, and he had had no

rigor or other unpleasant symptom. As his bowels had not been evacuated the day before, I directed an injection to be administered without delay. In the evening, he was in all respects well; a soft pulse, a clean tongue, and a countenance nearly free from the expression of anxious distress which had characterized it previously to the operation, led me to conclude that there was little reason for apprehension.

Great part of the wound healed by the first intention, leaving very little deformity; but the cure was delayed by an œdematous state of the limb, which distended the newly-formed cicatrix, and impeded the contraction of the granulations in those parts which did not unite in the first instance. To counteract this disposition, I used fomentations with warm salt water, and the pressure of a firmly applied flannel roller. The joint remained movable to the natural extent; but though the patient could use his hand almost from the first, he did not regain any command over the elbow until the end of several months. And even now he does not possess much strength in it. He is able, however, to use it in giving instructions in arithmetic, etc. It may be proper to observe, that this individual is characterized by an extreme degree of what is usually called nervous constitution, and altogether a most unfavorable subject for this or any other operation.

Case IV.

A. L., aged eight, in February, 1828, fell upon his left elbow while playing with some other boys. The joint soon afterward became enlarged, stiff, and painful; but not so much so as to excite alarm, until the month of April, when his mother brought him to me for advice. I then found the appearances very unfavorable, the limb being straight and nearly immovable, with much swelling of the joint. The usual measures were employed, but did not prevent the formation of an abscess, which pointed on the outer side of the elbow between the radius and olecranon. I evacuated the matter by incision, and advised that the patient should be taken to the country, as his health had suffered considerably. About the middle of August he returned to town much improved in all respects; his general health being quite restored, and the joint being much more movable as well as diminished in size. Matters continued in pretty much the same state till October, when, finding that the sinus did not heal, I introduced a probe and ascertained that the olecranon was carious. Having explained the obstinate nature of the complaint, which rendered a spontaneous cure hardly, or rather not at all, to be expected, and the necessity of ampu-

tation at some future period almost certain, I readily obtained permission to do what I thought proper for the patient's relief.

On the 20th October, I exposed the olecranon, and by means of cutting-pliers removed a great part of the shell into which it had been expanded; this enabled me to extract some loose pieces which lay within the cavity. Hoping that these might have occasioned the obstinacy of the complaint, I prosecuted the excision no further, and dressed the wound with dry caddis.

The patient made no complaint whatever after the operation. He could not be confined to bed after the first day, and was with difficulty persuaded even to remain at home. The wound assumed a very healthy appearance, and soon contracted to its former size; but then it remained stationary, and the probe discovered that there was still some diseased bone.

Perceiving that another operation was required, I determined to make it an effectual one. On the 27th November, I made a crucial incision, like a St. Andrew's cross, so as to obtain four flaps, which, being reflected, I divided the ulna below its coronoid process with the cutting-pliers, and then removed the detached portion, not without considerable difficulty, owing to its connection with the *brachialis internus*. I next examined the radius, and, finding that the center of its round articular surface was carious, cut off the head with the pliers. I then directed my attention to the humerus, and, observing an unsound part in the trochlear hollow, removed the whole articulating surface. Having thus finished the operation, I brought the edges of the wound together by means of four or five stitches. There was little bleeding, and no occasion for any ligatures.

Very slight disturbance of the constitution followed, but the wound did not unite in any part by the first intention. There was some sloughing of the unhealthy soft parts, and very profuse suppuration, which, however, in the course of a few days, diminished to the usual proportion of a healthy sore. The patient was running about by the end of the first week, and in a fortnight longer the wound was all but healed. It continued to discharge a small quantity of thin serous matter for some months afterward, but at length closed entirely. The mobility of the limb was at first considerable, but gradually diminished, owing, I believe, partly to the increasing contraction and rigidity of the cicatrix, and partly to the willfulness of the patient, who would not exercise the limb as he was instructed to do. The elbow is now nearly stiff; but as the other joints are perfect, and the muscles of the limb retain their full strength, he suffers little inconvenience.

I may remark that this case led me to adopt excision of the elbow-joint. I had been long thinking of this operation, and in 1826 was very anxious to perform it on a boy, whose arm I afterward amputated, as the other gentlemen consulted would not sanction my proposal. In the case just related, the disease seemed to be so completely limited to the olecranon, that I expected to remove the diseased bone without encroaching on the joint. This expectation was not realized, but the very slight irritation which followed the imperfect operation I performed with this view, emboldened me to act with more freedom, and, happening to meet at this time with the case of Mr. Y., I did not hesitate to perform the complete excision that has been related.

Case V.

Ossory Fitzpatrick, forty years of age, a shipcarpenter from Liverpool, applied to me on the 1st January, 1829, on account of an affection of the left elbow, of which he gave the following history: Somewhat more than a year before he began to feel occasional wandering pains about the joint, together with some stiffness in moving it, but was not deprived of the use of the limb until several months afterward, when it swelled and became excessively painful, with violent disturbance of the whole system. The fever subsided, but the joint remained swelled and painful. An abscess was opened by the knife, and others which formed afterward were evacuated spontaneously, but none of the apertures had closed. On examining the sinuses with a probe, I readily passed it through the joint, grating against carious bones. I proposed excision, and, meeting with the patient's ready consent, performed it a few days afterward.

Having placed him on a table with his face downward, so as to present the elbow conveniently, I made two square flaps, as in the first case. Finding that the ulna was diseased as far down as the coronoid process, I first sawed off the olecranon, and then cut away what more of the bone required removal with the pliers; this mode of procedure obviated the difficulty occasioned by the attachment of the *brachialis internus* which I had experienced in the second case. I next detached the head of the radius, which was completely carious, and then sawed off the extremity of the humerus; but as the disease did not seem to be eradicated at the ulnar tuberosity, I cut away both it and the radial one, so as to leave no room for anxiety or doubt. No ligatures being required, I inserted five or six stitches, so as to keep the cut edges in contact; then applied some folds of caddis; and, lastly, supported the limb by means of a roller. The operation in this case was much

more difficult than in either of the former, owing to the extremely firm connection of the soft parts.

The wound healed entirely by the first intention, except a space not larger than one of the original sinuses, and the patient suffered no constitutional disturbance. In two or three days he was walking abroad; and about the end of a fortnight, the cure might be considered complete. Happening to lecture at this time on the subject of caries, I showed him, together with the other patients, to my class, as a proof that the recovery after excision of a joint was not so tedious as had been represented. The mobility of the elbow in flexion, extension, and rotation, was hardly, if at all, impaired; there was no deformity; and he not only retained the full use of his hand, but had regained very considerable voluntary power over the motions of the forearm. He left Edinburgh about the end of February, suddenly, in bad humor, at my refusing to give him a certificate of the operation he had undergone, which, as it could have been used only for begging, I did not feel inclined to grant. I have neither seen nor heard distinctly of him since; but vague and contradictory rumors have reached me, from time to time, of his being under treatment in some of the Dublin hospitals, on account of the old complaint. Should this really be the case, I think his relapse might be easily accounted for, by the exposure to which he must have been subjected, in performing so long a journey at such an inclement season of the year and so soon after the operation.

Case VI.

Janet Burns, aged twenty-five, from Carnwath, was admitted into the Surgical Hospital on the 8th of May, 1829, for caries of the elbow-joint, which had existed for twelve months, and would have been considered amply sufficient to justify amputation. The operation was performed in the manner that has been described, and the after-treatment did not differ in any respect that requires to be mentioned. She was harassed by a slight degree of chronic bronchitis, which delayed her recovery, and rendered the complete and permanent re-establishment of her health somewhat doubtful.

She returned to the hospital last June, on account of a ganglionic affection of her knee, and had then regained the use of her elbow-joint so completely that, when her hands were used in any ordinary employment, such as adjusting her dress, sewing, etc., no one would have supposed that it was in any respect defective; and, when she was so engaged, I have repeatedly puzzled strangers, by desiring them to fix on the arm which had been the subject of operation.

Case VII.

John Wells, aged nine, was admitted into the Surgical Hospital on the 7th of July, 1829, on account of disease in the left elbow, which arose from a fall, and had existed for several months. The limb was considerably swelled about the joint, and there was a sinus which allowed a probe to reach the bone.

The olecranon seemed to be the part chiefly, if not solely, affected; but I resolved to remove the whole articulation, both because some other part of it might be affected, and also because any portion of it allowed to remain might occasion a relapse. After sawing off the extremity of the humerus, and cutting away with the pliers the olecranon and head of the radius, I thought, from the appearance of the different surfaces, that enough had been done, and dressed the wound. When the excised portions were afterward more carefully examined, it was observed that the surface of the olecranon presented a small carious cavity, a portion of which must have been allowed to remain. I immediately undid the dressings, and, by replacing the olecranon, discovered the carious part, which was a sort of cylindrical excavation, no wider than a common quill, but running deeply into the bone. Having ascertained its extent by introducing a probe, I insulated the ulna as far as was necessary, and cut it across through the shaft, so as to detach the whole spongy portion of the bone. In doing this, a large vessel, I suppose the interosseous, was cut, and required a ligature.

Notwithstanding the comparative severity of this operation, in which the bone was removed to so great an extent, and the attachments of all the muscles were divided, except that of the biceps, the patient made an excellent recovery, and, being of a most docile disposition, assiduously exercised the limb in performing its different motions. In the course of a few weeks it became almost as useful to him as ever, and it can now hardly be distinguished from the other; the patient uses them equally for climbing, lifting weights, and wrestling with his companions. When I asked him one day if he knew any difference between them, he replied: "None, except that he could houk (*Anglicè dig*) a hole deeper with the one than the other;" and it was accordingly found, by measurement, that there is nearly an inch of difference between their respective lengths, though this difference is not perceptible except on a careful comparison.

This boy resides in the neighborhood of the hospital, and can be seen at any time by those who are interested in the subject. To give some idea of the perfect freedom with which he can use the arm, I

have caused it to be represented in the most complete states of extension and flexion which he can make it undergo by the action of its own muscles. (Figs. 8 and 9.)

Fig. 8.

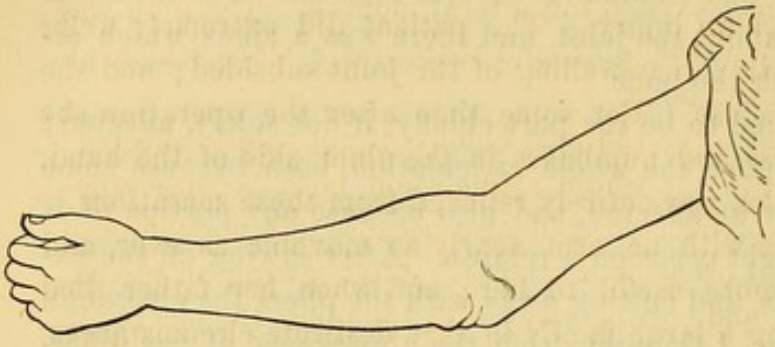


Fig. 9.

Case VIII.

Elizabeth Johnston, aged fifteen, from Falkirk, entered the hospital on the 25th of August, on account of a disease in the right elbow-joint, which had existed for six months, having commenced spontaneously, and increased progressively, notwithstanding the efforts of her medical attendants. It now presented a most formidable appearance, the joint being so much swelled as to measure thirteen inches in circumference, while the arm above was reduced to little more than skin and bone. The skin over the olecranon was extensively ulcerated, and at different places, both in the front and back of the joint, the probe could be passed into sinuses which extended to the bones. The limb was straight, and nearly immovable. The discharge was profuse; the pain unceasing; and the irritation so great that the patient's strength seemed rapidly sinking. It was plainly necessary to do something effective for her relief; and both Sir George Ballingall and myself, on first examining the case, were of opinion that any operation short of amputation would be inexpedient, where there was such extensive disease, not only of the bones, but also of the soft parts. In the course of ten days, however, whether it was owing to a real improvement proceeding from the free vent which had been afforded to the matter by incisions, or was merely the effect of familiarity with the appearance of the joint, I fancied that it was not so hopeless as we at first believed, and resolved to make an attempt at excision.

The operation was performed in the usual manner, and was attended with very little difficulty, owing to the separation of the surrounding soft parts, which had been caused by collections of matter. The ole-

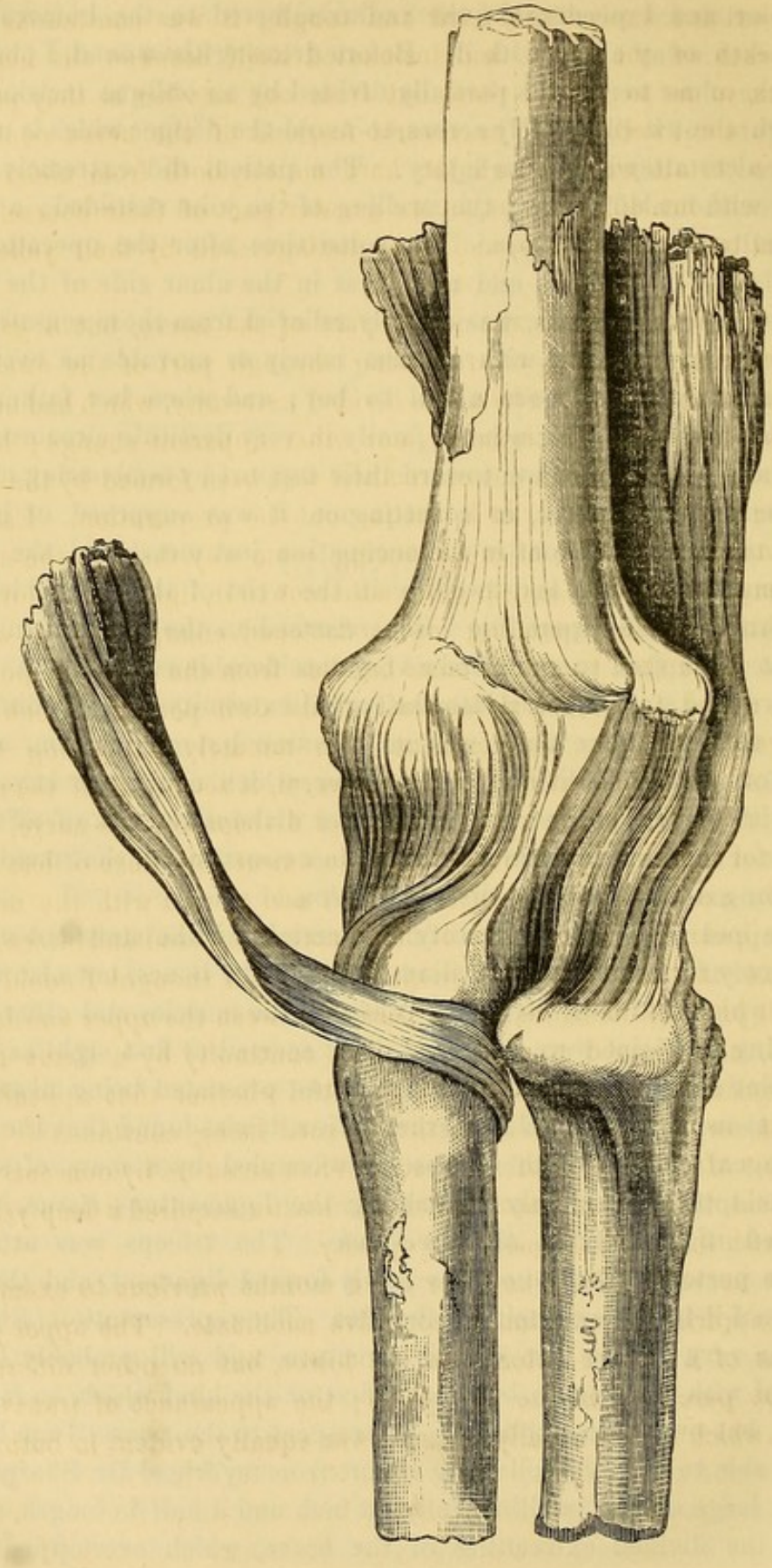
cranon was greatly expanded, and crumbled into fragments, which were extracted piecemeal; the radius adhered to the humerus, and was taken away along with it. Before dressing the wound, I observed that the ulnar nerve was partially divided by an oblique incision, and therefore cut it completely across, to avoid the danger which is usually believed to attend such an injury. The patient did extremely well; the wound healed kindly; the swelling of the joint subsided; and she gradually regained its use. For some time after the operation she complained of coldness and numbness in the ulnar side of the hand, but, before many weeks, was entirely relieved from these sensations.

She returned home with an arm nearly as movable as ever, and becoming every day more useful to her; and when her father died soon afterward, leaving a large family in very destitute circumstances, she was able to contribute toward their support by tambouring muslin. In the ensuing spring, in consequence, it was supposed, of having made too great exertions in the occupation just mentioned, she began to complain of pain and swelling in the wrist of the arm which had been subjected to operation. She returned to the hospital in June, and we were then sorry to find a very considerable enlargement of the wrist, with a sinus leading into the carpal extremity of the radius. In these circumstances, there was no resource but amputation, and I, therefore, performed it above the elbow, which could not have been left with any advantage, and, indeed, not without the risk of affording room for more mischief in a limb and in a constitution that manifested so strong a disposition to diseased action.

We had thus an opportunity of ascertaining the state not only of the newly formed uniting medium between the bones, but also of the nerve which had been divided. When all the muscles and other parts covering the joint were dissected off, it seemed at first sight as if the articulation still remained, the appearance presented being nearly the same as usual; but on closer examination, it was found that the place of the extremities of the bones was occupied by a mass of strong fibrous substance, closely resembling the ligamentous tissue, which allowed of motion in all directions. The triceps was attached to the posterior surface of this newly formed ligament, and through means of it to the extremity of the ulna. The representation (Fig. 10) gives a very perfect idea of this structure, and will probably be regarded with interest, as being the first of the kind which, so far as I know, has ever been published. In respect to the nerve, I am happy to be able to give the following report from my friend Dr. Sharpey:

"A large oblong swelling, fully an inch and a half in length, enveloped the divided extremities of the nerve, which overlapped each

Fig. 10.



other to some extent. The substance of this swelling was of a grayish color, and exceedingly hard and tough; it was continuous with the sheath of the nerve, and insinuated itself between the nervous bundles, so as to spread them out from one another as they passed through the swelling. The several fasciculi of the nerve could be traced a certain way through the hard matter, both from above and below, without difficulty, as, in the greater part of their course, they adhered to it but slightly, and were distinguished by their yellowish color.

"A few bundles from the lower part of the nerve, but a greater number from the upper, after passing through part of the swelling, terminated on its surface by a free divided extremity, which had undergone no thickening, enlargement, nor other apparent change; but it is doubtful whether these cut extremities had been formed by the original section of the nerve, or in cutting out the preparation. Each of the remaining fasciculi, after advancing some way through the enveloping mass, became at length more adherent to it, lighter in color, and augmented in size, expanding into a flattened enlargement, at which point it was united to one or more bundles from the opposite portion of nerve, and to collateral fasciculi of its own portion, which had undergone a similar enlargement. On minutely examining these points of union, of which there were several, it seemed as if the small cords, or funiculi of the upper and lower divisions of the nerve, were connected together by an intermediate flocculent substance of less than a line in extent, which, when macerated and viewed with the microscope, appeared to be made up of fine filaments crossed and interwoven with one another. At some points, however, I thought I could distinguish parallel filaments, which passed between the upper and lower funiculi, and seemed to establish their continuity by a tissue more analogous to their own; but it is doubtful whether that appearance was not owing merely to a particular cord being continued beyond the point of connection of the rest. When acted on by concentrated nitric acid, the intermediate filamentous matter acquired a deep yellow color, with increased firmness and opacity.

"The nerve had been kept for some months previous to examination in a spirituous solution of corrosive sublimate. The upper portion was of a deeper color than the lower, but no other difference could be perceived in the two parts; the appearance of transverse stripes, which nerves usually present, was equally evident in both."

Case IX.

James Page, aged eight, was recommended to the Surgical Hospital by Mr. Fergusson of Auchtermuchty, as a proper subject for excision of the elbow-joint, and was admitted on the 2d of January, 1830. The right elbow was much enlarged, discolored, and stiff. There were two sinuses opening on each side of the triceps, through which a probe could be passed to the bone. The operation was performed in the ordinary manner on the 12th of the same month, and he was dismissed on the 12th of March.

This boy was remarkably obstinate, and unmindful of the constant injunctions impressed upon him to exercise the joint; it has consequently become very rigid, and therefore impaired the utility of the limb; but that the arm is still of no small advantage to him, will, I trust, appear from the following letter, which the Rev. Dr. Taylor was good enough to write in reply to my queries respecting the patient's state after recovery could be considered complete.

Auchtermuchty, 28th July, 1830.

Dear Sir,—I am happy to be able to state respecting the boy James Page, on whose elbow you operated in the Surgical Hospital last winter, that his general health is quite good—that his elbow is free from pain, and about the same thickness as the other,—that though the wound cicatrized very slowly, it is now, and has been for some time, perfectly whole,—that his use of the *hand* seems to be not the least impaired; and accordingly he employs it, being his right hand, for ordinary purposes which do not require much motion of the elbow-joint,—that he seems to have the same strength in the arm operated on as in the other, for when he has anything of considerable weight to carry, for instance, as much water as he can bring in a pitcher, he does it with his right arm,—and that, though, as you must be aware from the state in which he left the hospital, he has but very limited motion at the elbow, yet he has a little. He usually puts on and takes off his bonnet, and can also use a spoon with his right hand, but for the latter purpose he generally prefers the left. On the whole, he is certainly in a vastly better situation than if he had lost his arm. I believe every one who sees him readily acknowledges that.

I am, dear Sir, yours truly,

J. Taylor.

Case X.

James Alexander, aged nine, from Arbroath, entered the hospital on the 2d of February, 1830, on account of a disease of the elbow, under

which he had labored for eighteen months. There was a large opening on the external tuberosity of the humerus, through which the bone could be readily felt, and indeed seen. As there was no prospect of recovery without amputation or excision, I chose the latter operation, and performed it on the 9th of February. It was impossible to cut away the diseased part of the humerus, which was of very considerable extent, without opening the joint. And therefore, in coincidence with the principle so often referred to, I removed all the articulating surfaces.

The patient recovered extremely well and speedily from the operation; but when almost quite well, and just about to be dismissed from the hospital, he fell into a bad state of health, one effect of which was a superficial ulcer over the site of the old opening, that proved extremely obstinate, and yielded only to time and an alterative course of blue pill and sarsaparilla. He was dismissed cured on the 6th of May. In reply to an inquiry respecting his present state, which I addressed to Dr. Arrott, of Arbroath, I received the following letter from his son:

ARBROATH, 17th December, 1830.

MY DEAR SIR,—I called upon James Alexander yesterday, and was much pleased to find his elbow-joint quite sound. Though the motion is a good deal limited, yet the limb is equally strong with the other, and as useful for many purposes. There are several sores on different parts of his body, the same as the one which made its appearance when he was in Edinburgh. Is there anything which you think would be of use to him? His health is otherwise good.

I remain, dear Sir, most truly yours,

WILLIAM H. ARROTT.

CASE XI.

John Malloch, æt. thirty, from Perth, a missionary of the Baptist persuasion, entered the hospital on the 23d of June, 1830, on account of a diseased elbow-joint, of which the following account appears in the Journal:

"His left elbow is very much enlarged, œdematous, and inflamed. There are two sinuses communicating with the joint; one situated immediately over the olecranon, and the other about three inches lower down. There is little pain, except on pressure, when it is very acute. He cannot allow of any motion of the joint, keeps his fingers extended, and seems to be afraid of moving the arm in the slightest degree.

"Seven years ago, he fell upon his left elbow and bruised it; two

months afterward it swelled and suppurated; and the discharge continued through several successive openings for two years. It then healed up, but remained swelled and stiff. Last January he was attacked with severe pain in the joint, which increased till five weeks ago, when matter formed, and was discharged by one of the former openings. A fortnight afterward, another abscess collected over the olecranon, and was opened by a surgeon in Perth.

"25th. Mr. Syme proceeded to cut out the elbow-joint. Running the knife into the joint with its back to the ulnar nerve, he made a transverse incision across the arm, close to the olecranon, as far as the external condyle. From the middle of this incision another was made down the arm over the ulna, about three inches in length, and from the extremities of the one first mentioned two were made up the arm, about two inches long. The flaps being dissected back, the articulating extremities of the ulna, humerus, and radius were removed. The diseased synovial membrane was cut out, and the edges of the wound were then brought together by stitches. Two arteries spouted, but did not seem to require ligatures. The limb was placed in a bent posture, enveloped with caddis and a long bandage, to give it support. In this case a longitudinal incision was made downward from the center of the transverse one, instead of two at its extremities, since the sinuses were thus included in the line of incision, and the ulna more readily exposed, which was the bone principally diseased.

"Cloths wet with cold water were applied after the operation, to check the disposition to bleed; but about two o'clock, as there was still a good deal of hemorrhage, the dressings were removed, when it was found to proceed from an artery in the integuments of one of the lower flaps. The bleeding vessel being tied, the dressings were replaced.

"26th. The wound is looking very well, and seems as if it would heal by the first intention. Pulse quick. Cold lotion to be continued. Tartrate of antimony, with Epsom salts, to be taken every hour.

"28th. There is a good deal of constitutional irritation. He complains of oppression over the stomach, and a little difficulty of breathing. The wound has not healed.

"29th. A copious fetid discharge from the elbow, with some redness and tension.

"30th. Feels much better; swelling subsiding. Acetate of lead lotion, with bandage, to be continued.

"July 1st. Appetite much better. To sit up in bed.

"2d. He was out of bed most of the day.

"3d. The redness and swelling are quite gone. The edges of the

wound to be brought together with adhesive plaster, and sulphate of zinc wash to be applied with bandage.

"5th. The elbow is looking well, and the wound is granulating kindly. To have steak and a pint of porter.

"9th. He had rigors yesterday. Elbow appears to be doing very well.

"15th. The cross incision has almost healed, but the longitudinal one is kept open by the ulna being bare at its extremity, which threatens to exfoliate. A large abscess has formed on his right hip.

"16th. The abscess was opened and a poultice applied.

"19th. He has had frequent shivering and sweating fits; pulse quick and weak. To have wine instead of porter. Mr. S. laid open the sinus in the hip, the discharge from which was profuse. Dry caddis and bandage applied. The elbow is improving, the discharge is not nearly so great; and a distinct groove can be felt on the ulna between the dead and living bone.

"20th. He thinks himself stronger; the rigors are not so frequent. To have sulphate of quinia, a grain and a half three times a day, and a glass of port wine every three hours.

"24th. He had rigors twice yesterday afternoon. About two o'clock this morning, when at stool, there was considerable hemorrhage from the hip. He is weaker than yesterday, and complains of great pain in his right groin, which is a little swelled.

"25th. He is no better, pain in the groin is still much complained of.

"26th. His pulse is much weaker, the pain in the groin is excessive; obscure fluctuation can be felt on the iliac side of the vessels.

"27th. He complains of embarrassment in his breathing, with pain of chest. Pulse 160.

"29th. He has been slightly delirious; other symptoms as before; he is much weaker.

"30th. Cold cloths applied to his forehead at his own desire. Pulse can hardly be felt.

"31st. He died."

On dissection the abscess of the hip was found to extend upward among the muscles, as high as the lumbar region. There was an extensive abscess between the ilium and *iliacus internus* descending into the groin. There were old adhesions between the *pleura pulmonalis* and *costalis* on both sides, but especially on the right. Upon the center of the anterior surface of the left lung lymph had been recently effused to a considerable extent, and about eight ounces of seropurulent turbid fluid lay in the pleura of the same side. The lungs in

several parts were indurated or hepatized, and in some places suppuration had taken place so as to form deposits of the size of a walnut. On the surface of the brain the vessels were more turgid than usual, and in some places there were small ecchymoses. Great part of the wound was healed, but the extremities of both the humerus and ulna were exfoliating.

This unfortunate man, whose thin, emaciated, care-worn appearance indicated an age not less than fifty, though it really was no more than thirty, was certainly, as the result showed, a most unfavorable subject for operation; and I sincerely believe that any operation, however slight, which had the effect of at all disturbing the constitution, would have given rise to equally disastrous consequences. This extreme tendency to disorded action could of course be learned only when it was too late.

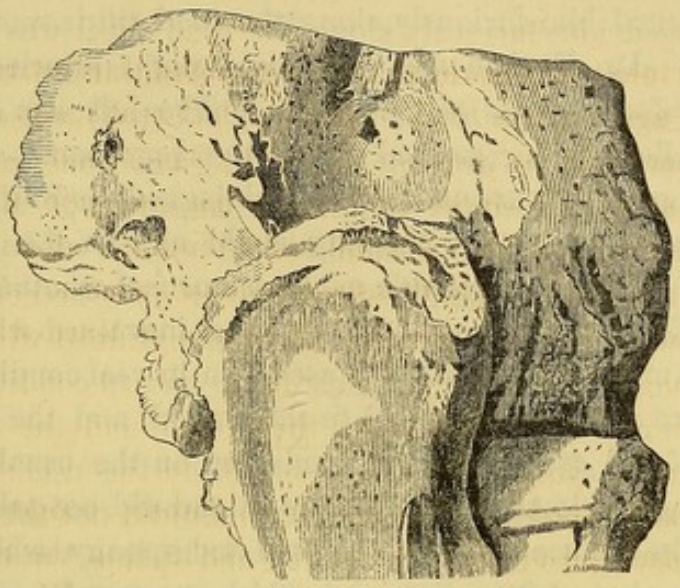
Case XII.

David Forret, aged twenty-eight, from Cupar, recommended by Dr. Scott, was admitted on the 14th of July, 1830, into the Surgical Hospital, on account of disease in the right elbow. Nine months previously he began to feel gnawing pain in the back part of the joint, attended with little swelling, but some stiffness. In January a small tumor appeared a little above the internal condyle, and opened a fortnight afterward by an orifice which has continued to discharge ever since. In March, without having suffered any perceptible injury, the joint inflamed, becoming very red, greatly swelled, and excessively painful, especially when subjected to the slightest pressure or motion. He was bled and leeched repeatedly, with the effect of subduing the intensity of the symptoms, but the disease persisted, as was proved by the formation and opening of other abscesses, the orifices of which still remained. The limb had been long entirely useless, and his health had latterly given way so much as to satisfy his friends that he would speedily sink under his complaint, unless some relief was afforded. He was pale and excessively thin; his face exhibited the wrinkles of old age, and his hair was thin and dry.

I performed the operation on the 19th, and removed the portions of bone represented in Fig. 11. The synovial membrane, being very much thickened and gelatinous, was cut away as far as possible, one small artery of the integuments was tied, and the edges of the transverse incision were stitched together. The extreme softness of the diseased integuments rendered it impossible to close the longitudinal incision in this manner, as the threads instantly cut their way out, and compresses of caddis were therefore applied, so as to keep them in

their place as nearly as possible. Notwithstanding considerable inflammation, he made, on the whole, a good recovery, and was most attentive in exercising the limb. He was dismissed on the 15th of

Fig. 11.



September. Dr. Scott, in reply to my inquiry as to his subsequent progress, writes as follows:

"CUPAR, 20th December, 1830.

"MY DEAR SIR,—I received your letter in reference to the young man Forret; but as he lives at some distance from this, some days elapsed before I had an opportunity of seeing him; he came to me, however, last Sunday, to show me his arm. It is about two inches shorter than the other. He can perform with it pretty well flexion and extension, particularly the former, pronation and supination, the latter, however, not completely. All swelling and inflammatory action about the joint have subsided. The wounds have almost healed. The joint is very flexible, capable of motion in any direction, resembling in this respect the orbicular joints. He can carry his arm to his head, and consequently feed himself; a matter of some importance, as it is the right arm. He seems much pleased with his condition, and grateful for what has been done for him.

"I am yours very truly,

"DAVID SCOTT."

CASE XIII.

—— Walker, a boy about eight or nine years of age, was recommended to my care last August, by Dr. Fletcher, of Dunkeld, on

account of an injury, the nature of which will appear best from the following extract of that gentleman's letter:

"About five weeks ago, little Walker went out with some other boys, who were herding a cow by the road-side close to the town. He tied the rope which was attached to the cow to his side. The cow ran off, and dragged him furiously along the road till it was stopped by the people." Dr. F. then mentions some slight injuries he had sustained on different parts of the body. "The left arm was severely injured, the flesh being ground off to the very bone, and the surrounding edges of the wound rough and jagged, as if the injury had been done by a grater No washing could expose the parts at the bottom of the wound, to enable me to see or feel whether the periosteum was affected, the whole surface being ingrained with mud and dirt so as to make it impossible to ascertain its real condition. Warm poultices were constantly applied to the wound, and the treatment of the constitutional symptoms was conducted on the usual principles." The injured parts sloughed off, but the wound did not take on a healing aspect, the surface being ash-colored and spongy, while a copious thin discharge issued from the joint, which was now found to be open. His health was much affected; and it appeared necessary either to cut out the joint or amputate the limb.

Though the great destruction of the soft parts and formidable appearance of the wound were somewhat opposed to the former operation, I determined to perform it, and did so a few days after the patient came to town. The ulna was the bone principally affected; but I thought it right to remove the articulating extremities of the others along with it. He made a good recovery, and went home at the end of three weeks, greatly improved in strength, with the wound almost healed, and such command of the arm that he could use it for many little offices, and even for lifting considerable weights. Wishing to know his present state, I wrote to Dr. Fletcher lately, and received the following reply:

"DUNKELD, 14th December, 1830.

"DEAR SIR,—I received yours of the 12th this morning, and am happy that it has arrived, to hasten my doing what I have intended to do for the last three or four weeks, viz., to let you know the success of little Walker's case. Until about that time there was always a slight discharge, sometimes with a scab, sometimes without one; but since then the part has completely dried up; and on examining it to-day, I found the whole surface covered with good sound skin, except one place, about the size of half a sixpence, which has a thin scab on it, though there is every appearance of its being like the rest in a few

days. But while the cure of the wound has been thus successful, the astonishing part of the case is the utility of the arm; its motions are perfect, and it is daily gaining strength; the degree it possesses already is really surprising. To suppose that it will be equal to the other arm is totally out of the question; but its usefulness is more than I could have expected, and certainly a thousand times greater than that of an unseemly stump.

"If anything unfavorable should happen in this case hereafter, I shall be sure to write you. I sincerely trust that nothing will go wrong; but if it should, I am confident the cause ought to be ascribed to constitutional fault, and not to the operation.

"I am, etc.,

"D. FLETCHER."

CASE XIV.

William Finlay, aged twenty-three, farm-servant from Cockpen, applied at the Surgical Hospital on the 3d of August, 1830, on account of a small abscess a little above the inner tuberosity of the left humerus, with considerable pain, stiffness, and swelling of the joint. This complaint had commenced three months previously, and resisted the usual remedies in such cases.

As the abscess seemed to be quite superficial and devoid of a hard basis, I hoped that it was not connected with the joint any further than as the effect of irritation there; and that the disease had therefore not advanced to its suppurating stage, and might be still within reach of the actual cautery. I accordingly opened the abscess, and made an eschar between the olecranon and external tuberosity of the humerus. A few days afterward, on examining the sinus, I found that it allowed a probe to pass to the bones. The patient was dismissed, at his own desire, on the 12th, with directions to go home and apply poultices. He returned on the 26th, and was readmitted.

His arm was now much worse, being greatly swelled and excessively painful. He was entirely deprived of rest, and could not permit the slightest movement of the limb without suffering the most excruciating agony. Several abscesses formed, and were opened after his admission. The acuteness of his symptoms then became somewhat mitigated, and I cut out the joint on the 6th of September.

The only circumstances observed on this occasion that seem worthy of notice are the following: *First*, the great size and strength of the bone, the patient being a tall and powerful man; *Secondly*, the state of the cartilage of the humerus, which was almost completely detached, though remaining entire, so that it lay within the cavity like

a piece of white leather, the subjacent surface of the bone being covered with a soft vascular growth; *Thirdly*, the extreme thickness and gelatinous condition of the synovial membrane, which seemed to constitute a great part of the swelling, and of which I thought it right to cut away some large portions.

The patient made an excellent recovery, and was dismissed on the 27th of October. He returned lately, so much changed in appearance that I really did not recognize him at first. The thin, dark, and sunken features were now full and florid, his gait was erect, and his appearance altogether that of a man in robust health. His arm is very movable, and daily acquiring more strength, which is already very considerable.

Case XV.

William Rogers, aged thirteen, was brought to me at the beginning of last summer, on account of a diseased elbow, which seemed to admit of relief by excision. The parents were dissuaded from submitting to this proposal by the representation of a practitioner adverse to the operation, who strongly recommended amputation in its stead. As this proposal was still less acceptable than the former, the patient was sent to the country, and placed under the care of an irregular practitioner. I was asked to see him again about the middle of September, and then found that a change had taken place greatly to the worse. The swelling, instead of being circumscribed and confined to the neighborhood of the joint, now extended half way both up to the shoulder and down to the hand. There were numerous sinuses; and, in short, an appearance of greater derangement of structure than I had ever met with, except in the case of Elizabeth Johnstone, above related; but, encouraged by the success experienced in that instance, I still deemed it right to perform the operation.

On the 21st of October, I cut into the joint and removed the olecranon as usual. It then appeared that the ulna was very extensively diseased, the cells of its spongy substance being filled with scrofulous matter. To make as sure as possible of taking away all the affected portion, I insulated the bone quite down to the commencement of the narrow part of its shaft, and cut it across there. As the boy Wells, who had an equally large portion of the ulna removed, made a perfect recovery, I hoped that the result in this case also would be satisfactory, notwithstanding so great a liberty had been taken with it. For nearly a week this hope promised to be realized. A good deal of inflammation indeed succeeded, but not more than I had frequently seen before. The clots of blood and sloughs of diseased structure

separated by degrees, and then the swelling and tension subsided. At this stage of the case, I went to the country to perform an operation, and returned the following evening, but did not see the patient till next morning, as I believed him to be doing perfectly well. His appearance then struck me remarkably. He had all along a pale unhealthy aspect, and quick, uneasy way of breathing; but now his countenance was much more thin, pale, and anxious; and his breathing was performed with a sort of catch. He had refused his food both this day and the day before. I believe that the limb should now have been amputated; but previous success made me too confident, and I contented myself with palliating symptoms, of which a very disagreeable one that next appeared was a tympanitic distention of the abdomen. On the 30th of September, he was evidently sinking under the irritation, and I then removed the arm with the advice of some of my friends, but certainly with very little expectation of preventing the fatal termination, which took place the day following.

The result of this case shows that there are limits determined by the extent of the disease, and the constitution of the patient, beyond which the operation cannot be extended with safety. These limits can be ascertained only by experience; and, therefore, such exceptions should be regarded as beacons, not to warn us against the operation, but rather to guide us to its safe and advantageous performance.

Case XVI.

John Nimmo, aged twelve, was admitted into the Surgical Hospital on the 1st of October. This boy had been an inmate of the same institution as the other. His complaint had commenced about the same time; and he also had been urgently advised to submit to amputation. The disease was in the left elbow, and presented nearly the same appearance that Rogers's did when I saw him first, which, as already mentioned, was much less formidable than when it was operated on. I performed the excision on the day on which his friend died, since he had come to the hospital for the purpose of undergoing the operation, and would probably have been discouraged if he had become acquainted with the unfortunate result. Unless my own mind had been well made up as to the advantages of the operation, it would have been no less unpleasant for me to operate than for him to submit. He made a good recovery, though rather difficult to manage in respect to exercising the limb. He was dismissed on the 27th of October; and, as he resides in town, occasionally calls to show us his progress in regaining the use of his arm, which is already very satisfactory.

WRIST-JOINT.

The wrist-joint, though not so subject to caries as the elbow, is nevertheless frequently affected with it; and in such cases there does not seem to be any other remedy than amputation. The operation of excision is liable here to very strong objections, such as the number and situation of the tendons, nerves, and blood-vessels, which can hardly be avoided; the exposure to injury not only of the tendons for moving the wrist, but also those of the fingers and thumb, the consequence of which would render the hand useless even if it were preserved; the difficulty of eradicating the disease owing to the number of bones entering into the formation of the joint, viz., the radius, ulna, scaphoid, lunar, and cuneiform; and lastly, the risk of the disease recurring, from the inflammation which must necessarily be excited by the operation, in the complicated structure of spongy bones and synovial membranes composing the carpus. In short, excision of the wrist would appear to be difficult of performance, very apt to be followed by relapse, and very likely to leave a stiff, unserviceable limb. It is fair, however, to admit, that these objections are theoretical, and experience may perhaps prove them to be of less importance than they appear beforehand. I, therefore, think it may not be useless to describe what would appear to me the best mode of performing the operation.

Two longitudinal incisions, about an inch and a half in length, should be made from the extremities of the radius and ulna upward, along the lateral aspects of these bones. Two shorter cuts may then be carried inward on the posterior surface of the wrist, from the lower ends of the former ones. The extensors of the thumb will thus, of course, be divided; and great care must be taken to avoid the radial artery where it turns over the end of the radius. The bones, being next exposed as well as possible, ought to be divided with the pliers as high as seems necessary,—their removal will then be easily accomplished, after which the carpal part of the articulation may be readily cut away with the pliers and gouge.

Moreau Junior and Roux have performed this operation, it is said, with good success.

CARIES OF THE CARPUS AND METACARPUS.

From the number and small size of the carpal bones, as well as their intimate connection with each other, and with the extremities of those of the metacarpus, it is extremely difficult to remove the whole extent

of caries occurring in this situation; and the disease must, for the reasons already mentioned, be very apt to return. The only cases in which it is prudent to make an attempt of this kind, are those in which the disease is stationary in its progress, where it seems to be of limited extent, and where there is no thickening in the neighborhood, indicative of a disposition to fall into the same morbid state.

When the surgeon determines to operate, he ought to give himself plenty of room by making a free crucial incision; and having raised the flaps so as to expose the bones, may then, by means of the gouge and pliers, take away the carious portion, which he recognizes by its softness and want of the toughness which characterizes sound bone. It is generally recommended to conclude the operation by applying the actual cautery; but as its effect on bone is confined to a very slight depth, the surgeon will do well not to trust to this subsidiary means, and rather endeavor to make his excision effectual in the first instance.

CARIES OF THE METACARPO-DIGITAL ARTICULATION.

It is by no means unusual to meet with caries of the first joint of the fingers and thumb; and a humane surgeon naturally feels averse to perform amputation for a disease of such limited extent. But, severe as this practice may appear, it is unquestionably the most prudent, since the shrunk and powerless digit which would remain in the event of a successful excision, so far from affording any compensation for the pain, time, and trouble spent in its preservation, could not fail to be a source of perpetual annoyance to the patient.

CHAPTER VI.

EXCISION OF THE JOINTS OF THE INFERIOR EXTREMITIES.

The inferior extremities being employed chiefly in supporting the body and in effecting progressive motion, can be more satisfactorily replaced by an artificial substitute than the superior. Their joints are large, and consequently require severe operations to remove them. And there is reason, on theoretical grounds, to suspect that the limb which would be saved by this means could hardly be more useful than

an artificial one. The objections to the operation, therefore, are greater, while the advantages of it appear to be less considerable than in the superior extremity. It would be wrong, however, to decide hastily against the use of excision in the inferior extremities altogether, the result of this practice, as applied to the arm, having so much exceeded expectation, and the few instances in which it has been tried in the leg having proved rather favorable to its adoption.

EXCISION OF THE HIP-JOINT.

It has been proposed to cut out the hip-joint on account of caries, and in the case of gunshot wounds shattering the head of the femur. In respect to the former of these cases there can be no hesitation in regarding the operation as decidedly improper, since it is well known that the acetabulum is with hardly any exception implicated in the disease, and usually suffers from it to a greater extent than the femur. Although, therefore, one out of twenty cases of *morbus coxarius* admitted of an effectual excision, an operator would certainly not be justified in the general employment of a practice which could be of use so very seldom. If it were possible to ascertain, previously to the performance of the operation, whether or not the patient could be freed by it from his disease, there might be some advantage derived from it; but as this is not the case, prudence and humanity equally forbid excision of the hip-joint.

The inefficacy of surgery in the third stage of the *morbus coxarius* is an additional reason for actively using the means which exert most control over it in the earlier periods of its progress, before the chronic inflammation has terminated in an alteration of structure. Of these unquestionably the most powerful is the actual cautery, and I beg to refer to the Reports of the Surgical Hospital for cases of its good effects in arresting the disease.

It ought to be recollected that the obstinacy of sinuses about the hip is not always owing to disease of the joint, but sometimes depends on exfoliation of the bones of the pelvis, the removal of which is speedily followed by a cure. As this fact has been very much overlooked, I may refer to some cases of it which I have recorded in the 99th number of the Edinburgh Medical and Surgical Journal.

When the head of the thigh-bone has been broken into pieces by a musket bullet, without any injury of the great blood-vessels or nerves, or extensive laceration of the muscles, it would certainly be better to extract the fragments than to perform amputation at the joint, as the patient would thus not only retain a limb that might probably be of

use to him, but also avoid the shock necessarily attending the removal of so large a portion of the body.

It has been found in trials on the dead subject that a single perpendicular incision, five or six inches long, commencing a little above the *trochanter major*, affords sufficient room for cutting out the head of the bone, where the parts are sound and free from morbid adhesion. The operation would, of course, be accomplished much more easily in the circumstances under consideration, owing to the comminution of the bone caused by the ball.

CHAPTER VII.

EXCISION OF THE KNEE-JOINT.

When the great size of the knee-joint, and consequent severity of the operation which is required for cutting it out, are taken into consideration, there seems reason for surprise that some of the earliest attempts at excision should have been practiced on this joint. It was probably the extreme frequency of amputation for disease in this joint that suggested the attempt at preservation, and forced it on attention more strongly than that of the elbow.

In the year 1781, Mr. Park, of Liverpool, cut out the patella, together with the articulating extremities of the femur and tibia, in the case of Hector McCaghen, aged thirty-three, on account of caries of ten years' standing. He made a crucial incision on the fore part of the knee, and found no difficulty in sawing off the ends of the bones. The patient made a tedious recovery, having repeated attacks of inflammation, and also sustaining an injury of the limb by falling when just beginning to use it, about six months after the operation; but at length at the end of a year was dismissed, and subsequently, as Mr. Park expresses it, "got a sound limb, and went to sea." The following extracts are important: "To the history of Hector McCaghen I have now to add, that he afterward made several voyages to sea, in which he was able to go aloft with considerable agility, and to perform all the duties of a seaman; that he was twice shipwrecked, and suffered great hardships without feeling any further complaint in that limb; but was at last unfortunately drowned by the oversetting of a flat in the river Mersey." "On the whole, from what I have now seen of

this man's limb, I do not hesitate to declare, that it appears to me so much more valuable than any artificial one, that, was I in his situation, I should infinitely prefer the former, at the price which he has obtained it." Mr. Park afterward operated upon another man, aged thirty-eight, who had labored under disease of the knee for three years; but he died of exhaustion about four months after the operation, which seems to have disheartened Mr. Park from making any further attempts to preserve limbs by cutting out the joints. In Great Britain no additional cases of excision of the knee have been put on record previously to those which I am about to relate. In France and Germany there have been one or two attempts of the kind, and a few years ago Mr. Crampton of Dublin tried the operation in two cases. The subjects of both were young women, and the disease white-swelling. In one no firm union took place, and the patient died three years and a half after the operation, exhausted by the discharge and repeated attacks of erysipelatous inflammation. The other made a good recovery, so that in "about six months after the operation the femur and tibia were consolidated by a firm bony union, and the woman, though timid beyond all example, began to lay her foot gently to the ground, supporting the weight of her body, however, on crutches. She now went to the country, and in the month of October, 1824 (fourteen months after the operation), I received a letter from my friend and pupil Mr. Rynd, of which the following is an extract: 'Your old patient, Anne Lynch, *walked* from Kilcork to Johnston House (a distance of nearly five miles) to see me this morning. She is in excellent health, and the limb is perfectly firm, though bowed outward.' Anne Lynch has been frequently in Dublin since that period, and has presented herself for examination at most of the hospitals. She is now in town; and I have this day, November 3, 1826, examined the limb, and find that the femur and tibia are firmly consolidated; the leg and thigh are not in the slightest degree wasted, but the limb is considerably bowed outward. She wears a shoe with a cork sole four inches thick, and, to use her own expression, 'is able to stand or walk the length of a day.'"*

The objections to excision of the knee-joint seem at first very great, and indeed insurmountable. It may be sufficient to mention the severity and danger of the operation, the tediousness of the cure, and the little difference as to utility between the stiff limb that is preserved and an artificial one. Upon closer examination, these objections, though they do not altogether vanish, certainly appear of less force.

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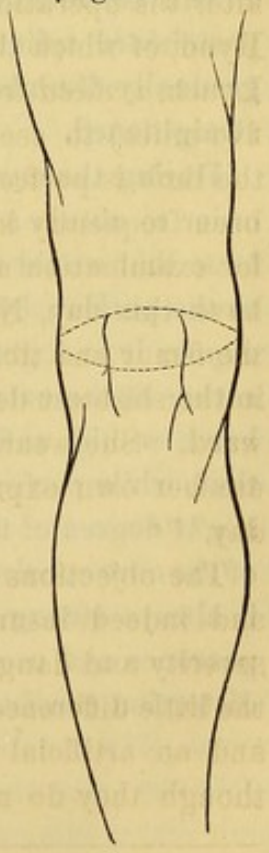
* Dublin Hospital Reports, vol. iv.

Thus the operation requires comparatively small superficial incisions, and can be accomplished much more quickly and easily than excision of the elbow-joint. It certainly must be regarded as more dangerous than amputation when the patient is very weak or exhausted by previous disease; but if he possesses moderate strength, I think it cannot be maintained, either on the general principles already stated, or from the result of experience, that the risk attending it is more than what proceeds from removing the limb. The recovery was certainly very tedious in Mr. Park's case, but there were particular circumstances which in some measure account for this; and the few patients who have since then undergone the operation recovered in a shorter time.

It ought here to be recollected, too, that though recovery from amputation of the thigh is usually completed in three or four weeks, it is generally *at least as many months* before the patient can rest the weight of his body on the face of the stump, so as to use it in standing or walking. As to the utility of the limb, we find that it can be employed freely in progressive motion, and all the patients have declared that they considered themselves extremely fortunate in having preserved their legs such as they were. The advantages of the operation which may be contended for, are, that it preserves the natural support of the body afforded by the bones and joints of the *tarsus*, *metatarsus*, and toes, which, by diffusing the effects of force applied at the extremity of the limb, protects both it and the other parts of the body from concussion; and that it obviates the necessity of resting the whole of the patient's weight on the *face* of a stump, which must be done when amputation is performed above the knee. On the whole, I am not inclined to condemn the excision of the knee-joint altogether; and at the same time cannot venture to recommend it, without more facts to ascertain the correctness of our hypothetical opinions on the subject.

Fig. 12.



The operation may be performed by different external incisions. Mr. Park made a crucial incision, Moreau two longitudinal ones, and another transversely below the patella. The best plan, I think, is to make two semilunar incisions across the fore part of the joint, extending from one lateral ligament to the other, meeting at their extremities, and including the patella between them. (Fig. 12.) Very free room will thus be afforded, which may be easily enlarged, if re-

quired, by cutting longitudinally at the point of union of the transverse incisions.

The patient being laid on his back, the surgeon should rapidly divide the integuments and other parts exterior to the joint, so as to open its cavity and remove the patella. Having next cut the lateral ligaments, he may readily protrude the extremity of the femur, and saw off as much of it as seems necessary. He has lastly to take away the diseased part of the tibia, which can now be done very easily, by passing the knife round the head of the bone so as to detach its connections, and then sawing off a slice of the requisite thickness.

During this process the popliteal vessels may seem to be in danger, but really are not so,—as the insulation of the bones is not performed until the ligaments which connect them together are divided, and no longer oppose their being separated from each other, so as to be more distant from the vessels. There is not much bleeding, but one or two of the articular branches may require to be tied. After the operation, a great difficulty has been experienced in bringing the limb into a straight position, owing to the contracted state of the flexor muscles, which still prevent extension, notwithstanding the relaxation that is afforded by shortening the bone. In this case, the surgeon must be satisfied with placing the limb on a double inclined plane, in as good a position as can be obtained by moderate force exerted through the means of pasteboard splints. In a few days it will be found that the tension gradually diminishes, and before long allows the leg to be completely straightened.

During the cure it does not seem proper to insure absolute rest, in order to obtain a true anchylosis or osseous union, since the very long bone that would thus be formed, besides being extremely inconvenient to the patient, by rendering the limb perfectly rigid, could not fail to expose it to a great risk of fracture, by affording long levers to forces acting at the extremities. A great degree of flexibility, on the other hand, would unfit the limb for support and progressive motion, so that, while perfect immobility and free motion ought to be avoided, a slight degree of flexibility ought to be promoted. The chief difficulty of the cure consists in preventing the tendency to bend outward, which is always strong, and, if not counteracted, most injurious to the appearance and usefulness of the limb. The best mode of opposing this distortion consists in the careful application of splints.

Case XVII.

John Arnot, aged eight, was admitted into the Surgical Hospital on the 1st of December, 1829, on account of disease in his left knee. The joint was much enlarged, and bent at an acute angle. There were two sinuses on the inner side, which allowed a probe to reach the bone. The disease had resulted from a fall on the ice, and was of three years' standing. His health was broken, and he seemed likely to sink soon under his sufferings, unless something was done for his relief.

On the 7th of December, I made two incisions across the fore part of the joint, extending from one condyle of the femur to the other, meeting at their extremities, and including the patella between them. The portion of integuments thus insulated having been removed along with the patella, which was very much diseased, I exposed the extremity of the femur and sawed it off as high as the tuberosities. In doing this the periosteum was separated from the bone, to which it adhered very slightly, for about half an inch, and I therefore thought it right to saw off another portion to this extent. The head of the tibia was next exposed, and removed by means of the saw and cutting-pliers. One of the articular arteries was then tied, after which I proceeded to dress the wound; but here an unexpected difficulty occurred, owing to the hamstring muscles being so much contracted that they still prevented the limb from being straightened, notwithstanding the relaxation they had undergone in consequence of the removal of the joint. I extended the leg as far as was practicable, and secured it in this position by a splint and bandage.

The patient had very little constitutional disturbance, but the wound presented a dry and unpromising appearance, and the tibia, from not resting in opposition to the femur, was drawn upward behind it, so as to make it press upon the integuments and threaten an extensive exfoliation. After several unsuccessful attempts, I at length succeeded, at the end of several days, in reducing the displaced extremities of the bones, when the limb became quite straight, and the tendency to dislocation almost entirely ceased. The cure afterward went on most satisfactorily, notwithstanding the restlessness of the patient, who did everything in his power to retard it.

In the course of four weeks after the operation the wound was all but healed, and the limb, before the expiration of three months, had regained so much strength that the patient could make some use of it in walking. It has been progressively improving since, and is still doing well. I have no doubt that ultimately it will be nearly as useful to

him as ever; but even at present he would be very sorry to exchange it for a wooden one. He can walk and run, though with a halt, without the constrained appearance of a person with an artificial leg, and merely requires the *heel* of the shoe to be two inches higher than the other. The limb is stout, and well nourished, and though slightly bowed outward, does not occasion any disagreeable deformity; it allows a slight degree of flexion and extension. This boy lives in town, and can be seen by any one who is interested in the subject.

Case XVIII.

Anne Mackintosh, aged seven, a very thin, weak, unhealthy-looking child, entered the hospital on the 14th of December, 1830, on account of a diseased knee-joint. There was a large sinus over the inner condyle, through which I introduced my finger and felt the joint extensively diseased; there was not much swelling, but the leg was retracted upon the thigh so as to form an acute angle with it. Encouraged by the promising state of the former patient, who seemed a much more unfavorable subject for excision than this one, I performed a similar operation on the 28th of December.

Great difficulty was experienced from the contracted state of the muscles preventing dislocation of the femur, and the surface of this bone, soon after the operation, presented a dry dead-like appearance; but the favorable termination of the former case, notwithstanding a similar and equally threatening aspect, prevented me from abandoning my sanguine expectations of success in this instance also. On the 6th of January, in order to prevent displacement of the bones, which all our efforts had been insufficient to effect completely, I cut away about two inches of the femur with the pliers, and then observed, with much concern, that the bone was denuded beyond the farthest extent to which my finger could reach. The patient began to sink soon afterward, and died on the 8th.

CHAPTER VIII.

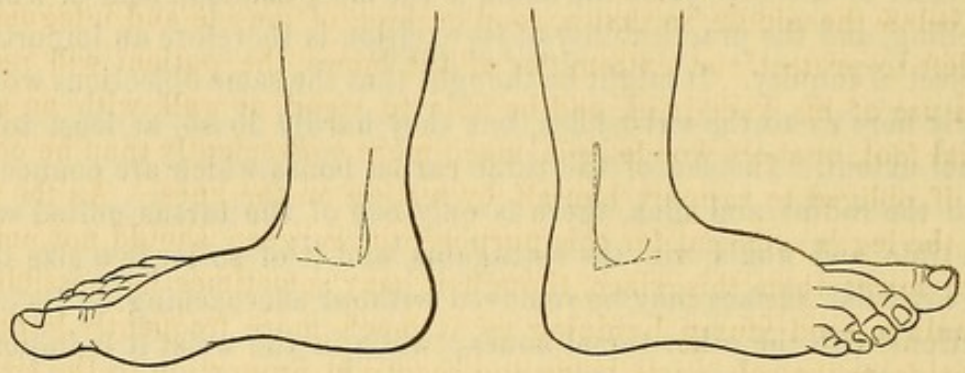
EXCISION OF THE ANKLE-JOINT.

NEXT to the knee-joint the ankle is the most common seat of white-swelling, and the practicability of its excision is therefore an important subject of inquiry. It might be thought that the same objections would apply here as to the wrist-joint, but they hardly do so, at least to an equal extent. Instead of the three carpal bones which are connected with the radius and ulna, there is only one of the tarsus united with the tibia and fibula, viz. the astragalus, and it of so large a size that the articular surface may be removed without encroaching on its connections with the other tarsal bones; while in the wrist it is impossible to take away any portion of the carpal part of the articulation without opening other joints, and thus laying the foundation of future disease by exciting inflammation in a structure predisposed to unhealthy action. In the ankle, too, the tendons are less numerous, and the bones are of a larger size, so that more room can be obtained for their removal. But though excision of the ankle may thus be not so objectionable as that of the wrist, it cannot boast of much advantage. The object to be gained being merely a support for the body, it may be questioned how far the foot that remains after the ankle-joint has been cut out is superior for this purpose to an artificial one. It appears, from the experience of Moreau, that anchylosis is very apt to ensue after the operation; and though, as he observes, the other joints acquire an unusual degree of mobility, so as to compensate in some measure for the rigidity which is thus caused, there can be no doubt that the elasticity of the foot will be greatly impaired. The limb, too, must be considerably shortened, and the ankle little calculated for bearing the severe strains to which it is exposed. It may be proper to notice also, that a very large proportion of the diseases usually referred to the ankle-joint are seated in the articulation between the astragalus and *os calcis*.

The best mode of performing the operation seems to be that practiced by Moreau. (Figs. 13 and 14.) Two incisions, three inches or more in length, are to be made along the posterior edges of the tibia and fibula, from their inferior extremities upward; and then two transverse cuts from the lower ends of these, in a direction forward, as far

as the tendon of the *tibialis anticus* on the tibial, and that of the *peroneus tertius* on the fibular side. The flaps thus formed having been raised, the bones of the leg are exposed and divided by means of the saw or pliers as high as may seem necessary, after which the separation of their ligamentous connections is easily effected. The articular surface of the astragalus may lastly be readily removed by the gouge or cutting-pliers.

Fig. 13. Fig. 14.



The limb should be gently moved during the cure, so as to prevent osseous union, since that would prove less convenient than a firm fibrous one, which may in some degree imitate the original joint in diffusing the force of twists or blows sustained by the foot.

CHAPTER IX.

CARIES OF THE TARSUS AND METATARSUS.

THE spongy osseous tissue composing the tarsus and heads of the metatarsal bones is frequently the seat of caries, and attempts have been made by Mr. Dunn of Scarborough, Mr. Liston, and others, to cut out the affected portions. Except when the disease is confined to the *os calcis*, so that it may be completely eradicated without opening any of the tarsal articulations, I am sure, so far as I am able to judge from my own experience, as well as the experience of others, that this practice will generally be unsatisfactory. The last case on which I operated, though very extensive, so as to require removal of the whole of the cuboid and part of the neighboring bones, did well; but this must be regarded as an exception from the general rule.

When the *os calcis* alone is affected, the disease may be extirpated by making a crucial incision on the fibular side, and then digging out the carious part with a gouge.

If the disease extends to any of the other tarsal or metatarsal bones, there is hardly any remedy but amputation; and if either the *astragalus* or *os calcis* be affected, of course the whole foot must be removed. It will be well, however, to recollect in such cases, that it is neither necessary nor useful to take away so much of the leg as is usually done. If the amputation is performed in a proper manner at or below the middle, so that a good cushion of muscle and integument is left to protect the extremities of the bones, the patient will retain the use of his knee-joint, and be able to stand or walk with an artificial foot, or short wooden pin, much more conveniently than he could do if obliged to support himself by resting on the knee. As the half of the leg is sufficient for this purpose, the surgeon should not amputate lower than this, since, though it may sometimes be possible to obtain a good stump by doing so, it much more frequently happens that, from the soft parts being too scanty in proportion to the size of the bones, these are badly covered.

When both the *os calcis* and *astragalus* are ascertained to be sound, it is fortunately practicable to save for the patient a useful part of his foot; and as the operation for this purpose has been much neglected in practice, especially in this country, I will describe it in the next chapter.

CHAPTER X.

PARTIAL AMPUTATION OF THE FOOT.

It is unnecessary here to consider the original operation of Mr. Hey of Leeds, in which the foot was divided between the tarsus and metatarsus; since, though much improved, and, indeed, it may be said perfected, by M. Lisfranc, it can seldom be practiced with advantage; for caries, I believe, never. When the disease is seated in the proximal heads of the metatarsal bones, it is obvious that the distal range of the tarsus must in all probability be also affected; in which case amputation between the tarsus and metatarsus could remove only part of the disease; and when the farther extremities of the metatarsal

bones are carious, there is seldom more than one affected, so that amputation of it along with the corresponding toe is sufficient. The operation of Chopart, which divides the foot through the tarsus, separating the *astragalus* from the navicular and the *os calcis* from the cuboid bone, may be performed more frequently and advantageously.

According to the observations I have been able to make on this point, when caries occurs in the foot, unless it affects all the bones of the tarsus, which is rarely the case, it is confined in general to one of the three following situations: 1. The articulation between the bones of the leg and the *astragalus, i.e.* the ankle-joint; 2. The articulation between the *astragalus* and *os calcis;* 3. The farther ranges of tarsal bones, and neighboring heads of those of the metatarsus. In this last situation, the disease, whether existing in the heads of the metatarsal bones, the cuneiform or the navicular and cuboid, is completely within reach of an amputation, which leaves only the *os calcis* and *astragalus.* Considering the great importance of preserving the heel, in respect both of utility and appearance,—to say nothing of the patient's feelings, who would of course much rather part with the half of his foot than the half of his leg, it seems extraordinary that this operation should not hitherto have been introduced into the practice of British surgery. As there can be no doubt that this neglect has proceeded from too readily receiving the theoretical objections which have been urged against the operation, I shall endeavor to state them fully, and ascertain what weight they deserve.

It has been said that the operation is difficult and painful,—that the cartilaginous surface which remains is adverse to healing,—that the extensor muscles of the ankle, from want of their usual opponents, the attachments of which must be cut away, will pull up the heel, and point the face of the stump to the ground,—and that even though not prevented in this way from being of use in supporting the body, the part of the foot which is saved cannot be more convenient than an artificial limb.

The difficulty attending Hey's operation, even with all Lisfranc's ingenious devices for discovering the seat of the different articulations and dividing the ligamentous connections, is certainly considerable, and might perplex even a practiced operator. But in amputating through the tarsus, so as to separate the navicular bone from the *astragalus* and the cuboid from the *os calcis,* the disarticulation may be performed with ease and certainty, if the simple directions, to be afterward given, are attended to. The operation can be performed in a few seconds, as the incisions succeed each other without any necessary

delay for changing instruments, and is therefore much less painful than amputation of the leg. In regard to the cartilaginous surface, it is now well ascertained that when it is sound, the apprehensions of bad consequences from such a source are either entirely without foundation, or, at all events, greatly exaggerated. After this very operation, I have seen the wound heal kindly by the first intention. The risk of elevation of the heel by the action of the gastrocnemius and other extensor muscles does seem, at first sight, a very serious objection, which, I confess, weighed so much with myself as to make me hostile to the operation, until I happened to see a patient in the hospital at Göttingen, on whom Langenbeck had recently operated. In this case there was no distortion, and I was assured that none had happened in several other cases of the same kind. The reason of this at the same time appeared, viz., the tendons of the *tibialis anticus* and extensors of the toes finding new attachments to the extremity of the stump. *Lastly*, as to the objection that the portion of foot which is saved will be of no more use than an artificial leg. I think if it is recollected that, by the operation in question, there are two joints preserved, which must greatly diffuse the force of any shock sustained by the foot, there can be little hesitation in admitting that the patient's comfort and facility in walking must be very much superior.

When the operation is to be performed, a tourniquet ought to be applied; and as it is always proper to compress vessels as near as possible to the part where they are to be divided, the pad should be placed over the posterior tibial artery, just above the ankle. Various minute directions have been given for determining the position of the joints. But the following very simple observation will, I am sure, be always found quite sufficient for the purpose. If the surgeon casts his eye upon the space between the outer ankle and head of the metatarsal bone of the little toe, he may easily ascertain the middle distance of these points; and this is the situation of the joint between the *os calcis* and cuboid bone. The other articulation, viz., that of the *astragalus* with the navicular, lies very nearly in the same transverse line; and the projection of the latter bone renders its discovery still more ready and certain. The flaps may be formed either entirely from the sole of the foot, or partly from it, and partly from the integuments of the instep; but the former plan is preferable, as affording a better covering for the bones. In this case it is necessary to make the flap extend fully to the balls of the toes, or farther extremities of the metatarsal bones; and it is here that one is most apt to go wrong, by cutting the parts too short for forming a good stump. In making the incisions, it is recommended to effect the disarticulation before

making the flap from below; but I have uniformly found, in operating on the dead subject, that it was extremely difficult in this way to cut it smoothly, owing to the relaxation of the parts in the sole of the foot, which ensues upon the separation of the bones. It is much better, therefore, to transfix the foot from side to side, and complete the section of the flap before opening the joints, while the parts are held steady under the knife. After this analysis of the operation, it may be well to give a connected account of the mode of performing it.

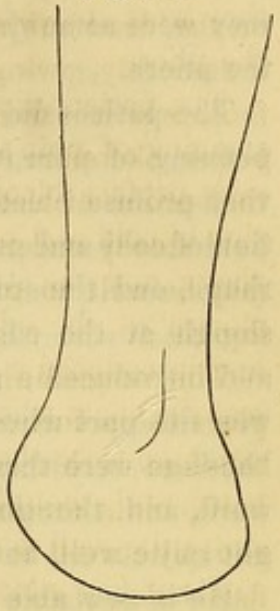
The surgeon, having recognized the position of the joints, should place the points of his thumb and fore-finger upon them, embracing the foot in his hand; then, with a small sharp-pointed amputating knife, blunt on the back, make an incision from the one to the other, slightly curved toward the toes, in order that it may correspond to the flap below; and next, instead of opening the joints, run his knife through from side to side, between the bones and flesh of the sole, and cut forward close to the bones, until he arrives at the balls of the toes, when he terminates the incision, not abruptly, but gradually, so as to have a smooth edge and surface. Nothing now remains but the disarticulation, which may be effected with extreme facility, as the surfaces of the joints are nearly straight, and in the same line.

The anterior tibial and external plantar arteries require to be tied; after which, the flap being stitched into its place, compresses and a bandage ought to be applied. The limb during the cure ought to be kept bent to relax the gastrocnemius.

Case XIX.

Ann Stewart, ten years of age, was admitted into the Surgical Hospital on the 4th of June, 1829, on account of a disease of the foot, which had existed two years, and assumed so serious an appearance as to have made amputation of the leg appear necessary. There was considerable thickening in the whole course of the tarso-metatarsal articulation; and an opening over the middle cuneiform bone allowed the probe to pass through this extent, at every part of which the characters of caries were recognized. As the parts seemed quite sound at the first range of tarsal joints, I resolved to save part of the foot by amputating here. The operation was accordingly performed in the way that has been described, and the result proved most satisfactory. The wound healed by the first intention, and the patient was able to put her foot to the ground in a fortnight, when it was observed that

Fig. 15.



she retained the power of counteracting the extensors of the ankle, owing to the flexors having already acquired new attachments. (Fig. 15.) She has now got a sort of artificial foot, which is extremely simple, and answers the purpose very well. It consists of a boot of the usual form and size, made of stout cotton cloth, reaching a little higher than the ankle, and lacing in front. The sole and instep are rendered unyielding by a thin plate and hoop of iron, and the whole of the cavity is stuffed with some soft material, except the space required for receiving the stump. This boot being put on over the stocking, is worn under an ordinary leather one; and the patient can walk, run, sit, and stand so naturally, that no person unacquainted with the condition of her limb would observe any defect in it.

Case XX.

William Gemble, printer, æt. twenty-four, a tall, thin, unhealthy-looking young man, of a dark complexion, and dissipated appearance, entered the hospital on the 31st of August, on account of pain and swelling of the foot. The swelling existed chiefly at the inner or tibial side of the instep, where there was an obscure sense of fluctuation, but also extended across, though not so prominently, to the outer edge. He had observed pain and enlargement for eighteen months, and had used blisters and leeches, but did not experience any considerable pain in it until a few weeks before the time of his admission, during which he had been confined to the house and prevented from following his employment.

In order to check the progress of the disease, I applied the actual cautery, but without success. An abscess formed at the inner side of the foot, and when it was opened, the tarsal bones were found to be extensively diseased. In these circumstances, I proposed the partial amputation of the foot, but could not prevail upon the patient to submit. He returned home, but came back again on the 1st of September, with his mind made up to undergo the operation.

The foot now presented a much more formidable appearance. Abscesses had opened in the sole, as well as at other parts, and the swelling was greatly increased; still, however, there was no indication that the ankle-joint, or the joint between the *astragalus* and *os calcis* was affected, and I therefore performed the operation, as in

Stewart's case. The cartilaginous surfaces were found entire, but, as they were somewhat discolored, I thought it right to cut them off with the pliers.

The patient did pretty well for two days, with the exception of complaining of pain in the stump, and having a very frequent pulse. A very profuse bleeding then ensued, and was arrested by the application of cold and pressure. Next day there was a return of the hemorrhage, and the stump was not only much inflamed, but beginning to slough at the edge of the flap. I carefully extracted all the clots, and introduced a piece of caddis between the *os calcis* and flap, which was the part whence the blood issued; graduated compresses and a bandage were then applied, and the case proceeded favorably afterward, and, though the patient made a tedious recovery, he ultimately got quite well, and was dismissed on the 13th of November.

He is now able to walk with great ease, and with hardly any visible lameness.

APPENDIX.

No. I.

RESULT OF M. ROUX'S PRACTICE IN THE EXCISION OF THE ELBOW-JOINT.

M. Roux is one of the few modern surgeons who have advocated the operation of excision. In 1812, he published an essay on the mode of performing it on the different joints which admit of its application; and he has since then tried it repeatedly in practice. He thinks the elbow-joint is the most proper subject for the operation; and in the Revue Medicale for January, 1830, gives the following statement in regard to it, which has already appeared in the Ed. Med. and Surg. Journal, vol. xxxiv. p. 209:

"I have performed the operation of excision of the elbow four times. The first was in 1819, the last a few months ago; one in the right arm, and three in the left. Three of the patients were males, one of whom was thirty-seven, the two others twenty-one and twenty-two years of age; and the fourth was a girl of nineteen. In all, the affec-

tion of the elbow was apparently of a scrofulous origin, and had attained a very advanced state of progress; for the joint was greatly swelled and surrounded by many fistulous openings, and the operation exposed an extensive fungous degeneration of the cellular tissue, as well as disease of the articular ends of the bones. I shall not describe the special disease in each case; neither shall I relate the method of operating, which was nearly the same in all, or the ulterior treatment required for accomplishing the healing of the wound and preservation of the movements of the arm. My sole object is to state the definitive results.

"Of the four patients one only died of the accidents immediately connected with the operation. The first dressings had been removed, and the wound several times dressed anew, and suppuration had commenced in the interior of the wound; nay, several of the sutures for preserving the flap in apposition had been also withdrawn, when hemorrhage took place from beneath the flaps. This returned repeatedly; so that at length it became necessary to think of amputation to save the patient's life. Perhaps I hesitated about it too long. Death ensued in three days. In the three other patients, there was not a single serious circumstance to complicate either the immediate or remote consequences of the operation; life was not for a single moment in danger. The cure, indeed, was not accomplished so quickly as might have been desired; occasionally, too, I dreaded a too abundant suppuration; it was also necessary to take measures against the retention and accumulation of pus in particular spots; and although one of the three was quite well three months after the operation, on the other hand, the two remaining patients did not recover entirely for eight or nine months. But ultimately the arm was preserved in every instance; and in every instance its movements were partially recovered. Unfortunately, the patient I first operated on in 1819, was attacked with phthisis only a few months after recovering the free use of the arm, and died of this disease, the seeds of which probably lurked in her constitution before the operation was performed. The two others, of whom one had the joint cut out two years, and the second three years ago, are at present alive, and in perfect health, and follow their customary occupation at Paris. One is a grinder, and the other a mantua-maker."

No. II.

CASE OF EXCISION OF THE ELBOW-JOINT, COMMUNICATED TO THE AUTHOR BY MR. SPENCE OF OTLEY, YORKSHIRE.

Nancy Fox, aged thirty-six, lives at Tulnec, near Leeds. Thirty years ago she received an injury of the elbow-joint, which from her own account appears to have been a partial dislocation. The injury was followed by inflammation of the joint and permanent rigidity. She became many years ago a patient in a provincial hospital, where amputation was proposed as the only means of affording relief, and, upon her objecting to it, she was dismissed.

The disease in the elbow remained much in the same state until two years ago, at which time a violent attack of inflammation, terminating in suppuration, took place.

In the beginning of June, 1830 (eighteen months after the suppuration commenced), she applied to me. The joint was now much enlarged, and presented two or three fistulous openings, through which the bones entering into its formation could be felt carious. I determined upon performing the operation of excision, which was accordingly done in the usual manner, and the condyles of the humerus, along with the olecranon, upper extremity of the ulna, and the head of the radius, were removed. The wound healed by granulation. It is now upwards of seven months since the operation was performed. She has a considerable power of flexion and extension in the new articulation, and can go through all the ordinary avocations in her family. There is still a small discharge from an opening on the fore part of the joint; this is, however, gradually diminishing, and there is every prospect of a complete cure.

OBSERVATIONS

ON

CLINICAL SURGERY.

PREFACE TO THE FIRST EDITION.

A SURGICAL case is read with interest by practitioners, not merely on account of its individual features, but because it illustrates the effect of treatment, and enables them to determine the value of practical principles for their own guidance. But at no period in the history of surgery has there been so much occasion for information of this kind as at present, since the profusion of vague and verbose compilations, together with the mass of crude speculation and reckless misrepresentation with which the medical press has of late years teemed, have so bewildered the minds of most men as to render them incapable of discriminating between the good and evil of what they read. There hence results a painful feeling of uncertainty, with constant straining after novelty as the wheel of fashion revolves, so that sound doctrines, instead of becoming more firmly established through time, are apt to be relinquished and replaced by the silly suggestions of presumptuous folly. Having for a long period of years been engaged in teaching Surgery, with the advantage of a great hospital for my field of instruction, I venture to hope that the expression of opinions which I have thus been led to entertain, together with the relation of cases showing their application in practice, may not prove unacceptable to the members of my profession. The observations now offered refer with few exceptions to cases that have occurred within the last nine months; and it is my intention, at no distant date, to publish some further illustrations of the principles which I am accustomed to teach.

PREFACE TO THE SECOND EDITION.

THE favorable reception which has required a second edition of this volume so soon after the period of its publication, induces me to offer it again, without any additions or alterations except in regard to verbal inaccuracies.

EDINBURGH, April 30, 1862.

CLINICAL OBSERVATIONS.

I.

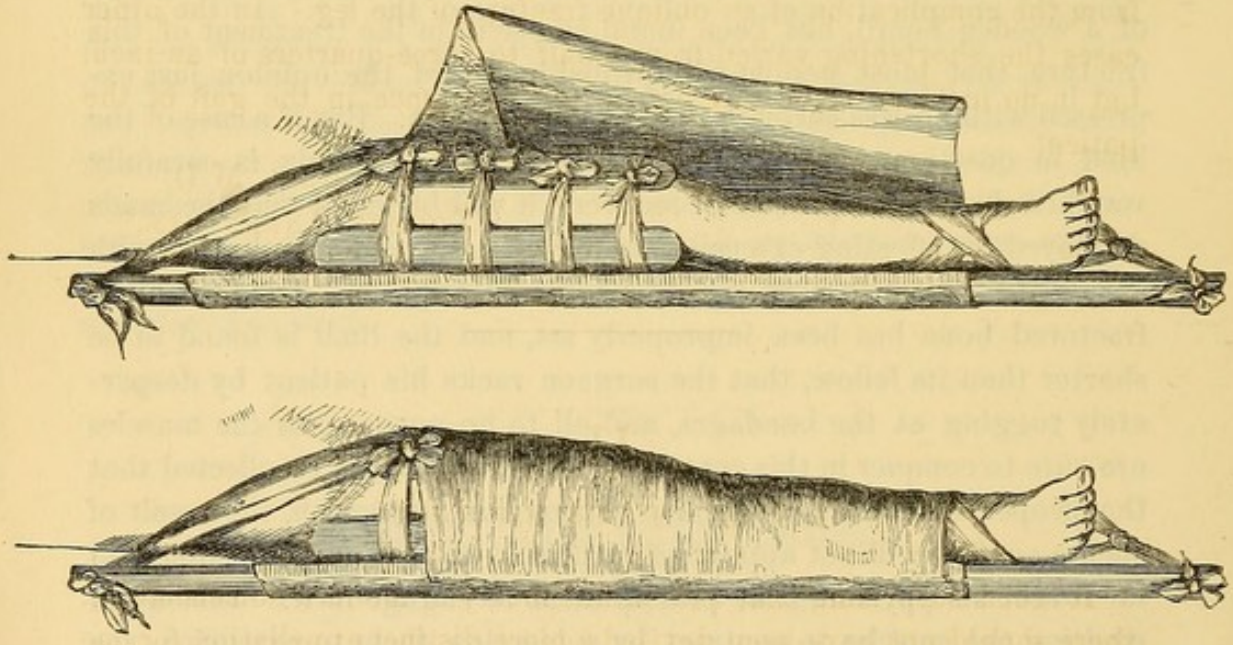
FRACTURE OF THE THIGH-BONE.

THERE are few principles of practice more firmly established than that extension is essential for the successful treatment of a fractured thigh-bone. I long believed and taught this as an incontrovertible truth, but for some time past have been satisfied that it is equally unsound in theory, and opposed to good practice. The "long splint" of Desault, which was contrived on purpose to effect extension by stretching the perineum and foot of the injured limb between the extremities of a wooden board, has been found so useful in the treatment of this fracture, that most people will probably regard the opinion just expressed with no less surprise than disapprobation. But if a case of the kind in question, which ultimately terminates favorably, is carefully watched during the process of recovery, it will be found that the bands employed for effecting extension are never tight, and merely tied with sufficient firmness to keep the apparatus in its place. It is when the fractured bone has been improperly set, and the limb is found to be shorter than its fellow, that the surgeon racks his patient by desperately tugging at the bandages, and all to no purpose, as the muscles are sure to conquer in this contest. Indeed, when it is recollected that the proper stimulus to muscular contraction is tension, the result of such a conflict will not appear so surprising as that any one should so far forget his physiological principles as to engage in it. Instead of exciting the muscles to contract by subjecting them to extension, the great objects in treating a fracture should be to place them at rest, and by protecting them from all sources of irritation to oppose their contractile action. For this purpose the prevention of motion is of most consequence, since every displacement of the broken surfaces must tend to irritate their muscular coverings, and hence the great

value of Mr. Pott's improvement in the construction of splints, by making them long enough to extend beyond the joints at both ends of the broken bone. It is upon the same principle that the splint of Desault proves so useful, since its influence extends over all the articulations of the limb, and by preventing any one of them from moving, keeps the whole in a state of perfect quiet.

In treating a fracture of the thigh-bone, the first step should be to draw out the limb to its proper length, direction, and shape; and if this cannot be done readily on account of the patient's involuntary resistance, it may be accomplished through the aid of chloroform. Two splints of wood, leather, or pasteboard, the full length of the thigh, from the trochanter major on one side, and the perineum on the other, to below the knee on both sides, are then to be applied and secured by four or five looped bandages; and lastly, the long splint wrapped in a sheet or table-cloth, of which enough is left free for covering the limb, being placed by the patient's side, the loose portion is brought over and fastened to the board, after which, by means of the perineal and ankle-bands, together with one round the body, the whole apparatus is rendered secure.

Fig. 16.



My present house-surgeon has had three cases of fractured thigh under his charge during the last three months, and the gentleman who preceded him had thirteen in the course of twelve months. They have given me the following table of their results:

"*Cases of Fractured Thighs treated in the Surgical Clinical Wards of the Royal Infirmary, from September*, 1859, *to March*, 1861.

Case	Name.	Age.	Result.	Time.
1	A. H.	25	Cured	42 days
2	J. B.	18	Cured	90 "
3	A. A.	9	Cured	42 "
4	W. W.	40	Cured	54 "
5	J. O.	22	Cured	73 "
6	J. D.	5	Cured	28 "
7	P. M'N.	45	Cured	52 "
8	R R.	2	Cured	17 "
9	P. W.	14	Cured	75 "
10	A. N.	5	Cured	35 "
11	P. F.	14	Cured	56 "
12	W. B.	12	Cured	35 "
13	M. C.	7	Cured	42 "
14	G. G.	55	Cured	58 "
15	J. K.	10	Cured	42 "
16	J. D.	17	Cured	35 "

"All of the cases here mentioned were treated without extension. In No. 11 the limbs when compared were found to be precisely of the same length. In No. 2 there was shortening to the extent of one inch, from the complication of an oblique fracture of the leg. In the other cases the shortening varied from a half to three-quarters of an inch, but in no instance made any perceptible difference in the gait of the patient.

"Joseph Bell, M.D.
"Thomas Annandale."

II.

DISEASE OF THE HIP-JOINT.

It seems surprising that with all the nicety of modern nomenclature, there should not have been devised a more distinct appellation for one of the most frequent and serious ailments to which the human body is liable, than disease of the hip-joint. This vagueness of language no doubt proceeds from the uncertainty which still exists as to the nature and origin of the disease in question. Sir B. Brodie supposed that it generally commenced with ulceration of the cartilages; but such a view is quite inconsistent with either the symptoms, or the resulting con-

dition in the event of recovery. Instead of suffering the excessive pain caused by motion or pressure, which characterizes disease of the cartilages, the patient is usually able to stand and walk on the affected limb for weeks or even months after beginning to show signs of the complaint; and if he recovers from it before the occurrence of suppuration, generally retains no trace of its existence, which could not be the case if the surfaces of articulation had been eroded. It may be added that the disease is most apt to commence at the time of life little prone to independent morbid affections of the articular cartilage, while the absence of swelling, and facility of restoration to a sound state, are quite opposed to the idea of synovial degeneration. In these circumstances it appears most probable that the morbid condition is originally an irritation of the osseous texture, which admits of either returning to health, or going on to alteration of structure, with its usual attendant of suppuration, and consequence of anchylosis or caries.

Disease of the hip-joint is extremely frequent in Scotland, as in other countries possessing a similar climate, so that there is ample opportunity of observing its progress both in public and private practice. Formerly, cases of this kind were regarded with dread, as sources of protracted suffering and subjects of ineffectual treatment, but they are now viewed very differently, since, if properly managed before suppuration has taken place, they may reasonably, or almost with certainty, be expected to afford a favorable result.

This great change has proceeded from the disuse of counter-irritations, and the establishment of perfect rest, as the grand means of remedy. It appears from the books published in London, and elsewhere, and also from the cases which not unfrequently come under my observation, that this salutary reformation has not yet become general, and hence probably the reason of so many operations being performed on the southern side of the Tweed for removing the head of the thigh-bone, which, even if we had the wish to do so, there would be little opportunity of repeating here.

The enforcement of rest in order to prove effectual must be complete, since the joint more immediately concerned cannot be kept quiet unless all the articulations and muscles of the limb are prevented from moving or acting; for moving the toes necessarily moves the ankle; moving the ankle moves the knee; and moving the knee moves the hip; while, even if the last-mentioned joint were so constrained by bandages as not to admit of motion, the action of its muscles would cause such compression of the articulating surfaces as might prevent the object in view from being fully attained.

The "long splint" fortunately affords a simple, easy, and effectual means of accomplishing this general quietude, and to it unquestionably is due the good effect of modern practice. It must be long enough to extend from the false ribs to a little beyond the foot, and equal in breadth to the diameter of the limb, being applied as for fracture of the thigh-bone, but without any additional support. In some cases the thigh is so bent upon the body that it cannot be straightened without causing great pain and using much force, but unless the bone has become dislocated, may always, through the influence of chloroform, be easily placed in a proper position, and does not show any tendency to resume its abnormal position after consciousness is regained. The length of time during which the splint is required varies with the circumstances of the case, but in general does not extend from beyond three to six weeks. The patient's friends frequently express apprehension of the health suffering from confinement, but are soon satisfied on trial that the effect is quite contrary. The only medical treatment required is regulation of the bowels and diet—which should be nourishing but not stimulating—wine being forbidden, and animal food restricted within narrow limits. Cod-liver oil, if it can be taken without repugnance, will be useful; but nothing can be more preposterous than the common practice of administering iodine and mercury in such cases, or on other occasions where a strumous constitution is suspected.

Case I.

A. D., aged six, from Kinross, was admitted on the 17th of February, 1860. Since the beginning of the year he had been falling off in flesh and strength. He complained of pain in the left hip and knee. The limb being considerably drawn up, and resisting extension, the long splint was applied through the assistance of chloroform, which allowed the limb to be straightened. On the 12th of April the splint was taken off, the limb being straight, and the pain gone. On the 16th the patient was dismissed cured.

Case II.

F. C., aged fourteen, an emaciated unhealthy-looking lad, was admitted on the 17th of February, 1860, suffering so severely from hip disease that his father had to carry him. On the 22d the long splint was applied as usual. On the 23d of March the pain was gone. On the 28th he was dismissed cured.

Case III.

F. G., aged twenty-three, from Carlisle, was admitted on the 6th of November, 1860, with the symptoms of hip disease, from which he had suffered for 13 months, and during the last eight so severely as to be unable for work. The thigh was obstinately bent on the pelvis. The patient had had several blisters applied, and been a month in the Carlisle Infirmary. On the 8th the limb was straightened under the influence of chloroform, but not without a considerable degree of force, and then had the splint applied. On the 10th the pain of both hip and knee was almost gone. On the 3d of December the pains were quite gone. On the 12th the splint was taken off. On the 22d it was reapplied in consequence of some pain being again felt. On the 10th of January, 1861, the splint was finally removed, the patient feeling quite well and desiring to return home. On the 12th he was dismissed.

Case IV.

D. C., aged eight, was admitted on the 31st of January, 1861, with disease of the hip-joint. On the 2d of February the long splint was applied under chloroform, on account of the limb being bent. On the 26th the splint was taken off. On the 2d of March he was running about the ward quite well. On the 4th he was dismissed.

III.

UNUNITED FRACTURE OF THE HUMERUS.

Ununited fracture seems a better expression for the purpose than artificial or preternatural joint, which is apt to suggest an erroneous idea of the condition denoted by it, since, in such cases, there is no new articular structure, but merely a ligamentous connection, which by its length and flexibility determines the extent of motion. This unfortunate result of a fracture, although it has been attributed to other sources, unquestionably, with hardly any exception, proceeds from the broken surfaces not being maintained in a state of sufficient rest during the process of reparation, and it is hence not surprising that the bone most liable to remain thus imperfect should be the humerus, which is doubly exposed to the exciting cause of disturbance through the frequent errors of using short splints, and allowing the patient too much freedom of locomotion. It is doubtless owing to

the same circumstance that the restoration of rigidity in this situation has been attended with peculiar difficulty, which, indeed, was considered nearly insuperable until a few years ago, when a plan of treatment was adopted that has proved successful in every case subjected to its influence.

With regard to the treatment of ununited fractures in general, I had long been satisfied that the expedients in ordinary use, or at all events usually recommended, such as rubbing the broken ends together, stirring up their connecting medium by the introduction of needles, or passing setons through it, if they were ever found to prove successful, did so not from their own direct agency, but from the enforcement of rest conjoined with their employment, which would have been equally efficient, although not associated with any other remedial means. By the careful application of proper splints the humerus may be kept sufficiently free from motion for the accomplishment of osseous union under ordinary circumstances; but to obtain that absolute immobility which is requisite for effecting consolidation when delayed beyond the proper period, is attended with no small difficulty. Indeed, the only mode of attaining this object seems to be the same as that employed in regard to disease of the hip-joint, with a similar view, which produces its effect by completely suspending action in all the articulations of the limb. In this case, however, such simple means as the long splint are not applicable, and the only way of keeping all the joints at rest is to envelop the whole limb, together with the scapular region, in a firm case of starched pasteboard, extending from the finger points to the back of the shoulder.

When the morbid condition is too firmly established for being remedied by the mere enforcement of immobility, there should be no hesitation in resorting to the only other means really capable of overcoming the difficulty; this is, cutting off the broken ends of the bone, together with the ligamentous substance connecting them, so as to obtain two osseous surfaces which may be placed in proper relation to each other, and then steadily maintained in it by the rigid pasteboard case, which should be prepared previously to the operation, and applied when the wound has ceased to discharge more matter than can be readily removed through an aperture in the covering. The incision should be on the outer side of the arm, and sufficiently free to afford ready access to the bone, which may be divided by a saw or the cutting-pliers. Any vessels requiring the ligature are then to be carefully tied, and the edges of the wound being stitched together, the arm requires merely the ordinary treatment of a compound fracture, by the support of two lateral splints until it is ready for being placed in the case.

Case I.

J. H., aged thirty-four, a private of the —— foot, while discharging some duty in the Redan, on the 8th of December, 1855, after the occupation of Sebastopol, was blown up by a Russian mine, which had escaped detection, and, in addition to some slighter injuries, sustained a fracture of the left arm between two and three inches above the elbow. He walked up to his regimental hospital, where splints were applied, and retained for a month, when, there being no signs of union, the ends of the bone were rubbed together, and supported by a starched bandage. He left the Crimea on the 3d of February, and was sent to the hospital at Renkeioi, where a seton was passed through the seat of fracture, and retained for five weeks without any benefit. On the 20th of May he proceeded homeward, and, after a long voyage of nearly two months, arrived at Portsmouth, whence he was transferred to Chatham on the 17th of July. No attempt to restore rigidity was made there, and at the end of two months he was dismissed the service, with a pension of one shilling per day, in consideration of his disability, which was regarded as equal to the loss of a limb.

In the hope that relief might still be afforded, he applied to me on the 22d of January, 1857, nearly fourteen months from the date of the injury; and finding that the arm was entirely useless through the extreme mobility of the ends of the bone, which overlapped each other to the extent of more than an inch, I resolved to adopt the only procedure that, in my opinion, afforded any reasonable prospect of remedy under such circumstances, which was to remove the ends of the bone, and afterward maintain the most perfect rest by placing the whole limb under restraint. Proceeding with this view, my first step was to have the arm put in an easy position, with the elbow bent at a right angle, and then covered from beyond the shoulder to the tips of the fingers with pasteboard and starched bandages, so as to acquire a case, which, when it became dry, effectually prevented the slightest movement in any of the joints. This case was next cut up on one side from end to end, so as to allow the arm to be taken out of it and undergo the requisite operation, which was performed under chloroform. An incision having been made along the outer edge of the triceps, I exposed the upper end of the bone, and sawed off a portion of it sufficient for obtaining a complete osseous surface. The lower end, lying anterior to the other, could not be subjected to the saw, but was removed, to the extent of more than an inch, by cutting-pliers. The arm was then supported by a couple of splints, and the patient lay quietly in bed for a fortnight, when the limb was placed in its

pasteboard case, in which an aperture had been made over the wound, then nearly healed, and discharging a very little matter that soon ceased entirely. The patient, feeling that the slightest motion was impossible, even if he had wished it, was relieved from any further restraint, and no longer remained in bed. At the end of a month, or altogether six weeks from the date of the operation, which was performed on the 30th of January, the limb was examined, and found to be quite straight, with a firm osseous union; so that the patient was able to leave the hospital, not only with his comfortable pension, but also with a perfectly useful arm.

Case II.

J. R., aged forty-one, was admitted into the hospital on the 22d of January, 1855, with an ununited fracture of the humerus of seven weeks' standing. It was seated at the distance of about a third from the lower end of the bone, and had been caused by falling from a scaffold of great height. The patient stated that immediately after the accident, splints of pasteboard were applied from the shoulder to the elbow, but not so as to prevent the motion of this joint. At the end of six weeks it was found that union had not taken place, and therefore my assistance was required.

On the 24th I directed the arm to be put up with rectangular pasteboard splints, extending from behind the shoulder to the tips of the fingers, covered with starched bandages, so as to form a case that completely prevented motion in any of the joints. On the 1st of March—that is, at the end of five weeks—it was found that osseous union had been established; but to save any risk of its being disturbed, the splints were reapplied for three weeks longer, when the patient left the hospital with a perfectly useful arm.

Case III.

J. C., aged forty-one, was admitted on the 3d August, 1858, with an ununited fracture of the humerus, of twelve months' standing, about the middle of the bone. He stated that on account of the injury he had become a patient in the Newcastle infirmary, and remained there, under the ordinary treatment by splints, for eight weeks, when, feeling the bone still movable at the broken part, he applied to several different surgeons, who told him that the arm would get strong in time; but finding that the expectations thus held out were not realized, he had come to me for assistance.

On the 18th, the starch and pasteboard case having been prepared by putting it on the arm, allowing it to remain until dry, and then taking it off, I cut down upon the ends of the bone, which overlapped and allowed of extensive motion. About a quarter of an inch having been removed from each of them, the edges of the wound were brought together and treated as usual. On the 27th the arm was put into the pasteboard case, in which an aperture had been made opposite the wound. On the 20th of September, suspecting from the appearance of the sore that it was suffering from some irritation, I searched the cavity and removed two small exfoliations. On the 16th of November osseous union was found to be established, and the patient, who slowly regained his health, which had been much disordered, was at length dismissed in every respect quite well on the 1st of March. I have heard that he afterward continued to be able for his work, which was that of a sawyer.

Case IV.

J. M'D., aged thirty-eight, was admitted on the 5th of March, 1859, with an ununited fracture of the humerus, of more than five months' standing. He stated that the injury happened in Glasgow, and that he went to the infirmary there, where splints were applied, but that three days afterward a collection of matter formed, which required the splints to be removed every third day during the following seven weeks, when he was dismissed, and continued to be an out-patient for fifteen weeks longer. Finding no improvement, he then applied to me.

On his admission it appeared that the wound was quite healed, but the bone remained very flexible about its middle. On the 14th, the pasteboard case having been prepared, I performed the operation as usual. On the 29th the arm was placed in the case, and on the 16th of August the patient was dismissed perfectly well.

Case V.

A. M., aged twenty-four, was admitted on the 5th of August last, on account of an ununited fracture of the humerus resulting from a railway accident that happened three months before the time of his application. The injury had been treated in the ordinary way without success, and then been subjected to the confinement of a starched bandage, which was at first employed simply, and again after rubbing the ends of the bone together, under chloroform. The patient then applied to me, with the arm very flexible at the seat of fracture, and quite useless.

On the 21st I performed the operation, and supported the arm with

ordinary wooden splints. Unfortunately the wound took on an unhealthy action, and instead of healing opened out considerably, so that the arm could not be placed in its pasteboard case until the 3d of October. Osseous union then commenced, but proceeded very slowly; and on the 15th of January I found that, though the bone was rigid in one direction, it still admitted of slight flexion in the other. I therefore desired the arm to be taken out of the case, and to have a cushion applied opposite the side to which it was movable, so that a wooden splint being placed over this, the two ends of the bone could be drawn toward it and thus rendered perfectly immovable. On the 20th of February I found the osseous union at length complete—and the patient was dismissed on the 5th of March.

On the 20th of March the patient returned from the country with a renewal of the fracture, from falling over a fence. He had his arm put up again in the pasteboard case, and on the 13th of May, being quite well, was dismissed, with advice to be more careful for the future. I have lately learnt that the arm is now perfectly strong.

IV.

ON THE POWER OF THE PERIOSTEUM TO FORM NEW BONE.*

The object of the following paper is to put at rest a question which has been long agitated in surgical pathology, and which is intimately connected with some important points of practical surgery. An apology may seem due to the Society for bringing under its consideration a subject which, though not exclusively professional, is still little studied except by those physiologists whose views are directed to surgery; but as the inquiry into which I propose to enter is neither long nor tedious, while it is quite intelligible without any previous knowledge of its details, I trust the patience of the members will not be exhausted; and if the question shall, as I hope, be decided to the conviction of those members who are conversant with surgical discussions, the prevailing diversity of sentiment relative to the point at issue will be more effectually composed than if I attempted to combat it through any other channel.

The question which I propose to consider is, "Whether the perios-

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* From the Transactions of the Royal Society of Edinburgh, vol. xiv. (Read 6th March, 1837.)

teum, or membrane that covers the surface of the bones, possesses the power of forming new osseous substance independently of any assistance from the bone itself?"

This property was first attributed to the periosteum by Duhamel, just one hundred years ago. Having been engaged in the study of vegetable physiology, and more particularly the formation of wood, he imagined that there might be an analogy between the inner layer of the bark and the periosteum, and that, as the former hardens in successive layers so as to constitute the wood, the latter might suffer a corresponding conversion into bone. He supported this opinion by the following arguments: 1. That when bones are burned in the fire or exposed to the weather, they separate into a number of thin plates. 2. That in consequence of disease arising from external violence, the bones frequently throw off thin scales, or exfoliations as they are called. 3. That when animals are fed alternately with madder and without it, their bones exhibit alternate layers of a red and white color; and 4. That when bones are fractured, they unite by means of an osseous capsule formed externally to, and embracing the broken extremities, just as the branch of a tree acquires strength after being grafted, or simply broken across.

This theory of Duhamel was strenuously opposed by Haller, who urged, as altogether inconsistent with it, the mode in which bones are originally formed. He carefully investigated the process of ossification during incubation, and detailed the steps of its progress in the chick as well as other young animals. The rudiment of the future bone, being traced from its earliest distinguishable appearance, was found first to present the characters of a jelly; then to acquire the consistence of cartilage or gristle; and finally to reach the perfect osseous state: whence it was contended, that a structure which thus originated in a distinct form, and independently of any other, could not owe its increase afterward to a different source. Haller also engaged his pupils Detlef and Boehmer in an extensive series of experiments, by breaking the bones of animals, and feeding them with madder during their recovery; from the results of which he inferred, that Duhamel has been mistaken in supposing that fractures are reunited by ossification of the periosteum.

Notwithstanding these objections, and the authority of the physiologist from whom they proceeded, the doctrine of Duhamel still maintained its ground; and not long afterward, viz. in the year 1780, derived a great accession of strength from the experiments of Troja, who, by destroying the marrow of bones, caused their death, and the formation of new shells surrounding them, apparently from ossification

of the periosteum. This experiment, which Troja himself performed some hundreds of times, when repeated and varied by the pathologists of almost every country, seemed to confirm the ossific power attributed to the periosteum beyond question, until Scarpa, the late distinguished Professor of Pavia, again investigated the grounds on which it was originally founded by Duhamel. In Scarpa's treatise, "De Penitiori Ossium Structura," which was published in 1799, he explained, that the foliated appearance presented by bones that had been burnt did not depend upon the development of a structure naturally belonging to them, but was an effect produced by the unequal action of the fire; and that the separation of scales from diseased bones was no stronger proof of their possessing a laminated structure, since thin and broad portions of dead substance are wont to be detached from the skin and other soft textures, in which it was never supposed that layers existed naturally. He recalled attention to the synthetic experiments of Haller, who, by investigating the formation of bone from the earliest stage to its perfect state, had established the reticulated nature of its texture; and by an opposite process of the analytic kind, which consisted in depriving bones of their earthy constituent by means of diluted acids, and then macerating them for a long while in water, he unraveled the texture so as to show that it really was reticular. As a consequence of these observations, Scarpa denied that bone could be formed by the periosteum; and this opinion was keenly embraced by several pathologists of the present century, and particularly by the French surgeon Leveillé.

At present, professional opinion is divided in regard to the ossific power of the periosteum, and different sides of the question are maintained by teachers and writers in this as well as other schools of medicine. As the point in dispute is not merely a matter of curiosity, but one of great practical importance, it is very desirable that the truth should be ascertained. It would detain the Society too long were I to show how the different opinions on this subject may influence the practice of surgery; and I shall, therefore, proceed to state the considerations which have completely satisfied my own mind, and are, I think, sufficient to satisfy any one who is open to conviction, that though Duhamel was misled into many errors by the false analogy which he supposed to exist between wood and bone—in regard to the mode of formation—the periosteum nevertheless does possess the power of producing new osseous substance, in certain conditions of disease.

The well-known and often-repeated experiment of Troja, which consisted in perforating the cavity and destroying the marrow of a bone, so as to kill it, and cause the formation of a substitute in the

form of a shell surrounding the old one, was devised in imitation of a process which not unfrequently occurs spontaneously in the human body. In this disease, which has been named Necrosis, a portion of the old bone dies, and becomes surrounded by a new one. There is an example of this on the table, in which the tibia, or principal bone of the leg, has been thus affected. The new shell is of a larger size and more irregular form than the old one, which may be seen through a number of circular apertures, lying a prisoner within this structure, intended by nature to serve as a substitute for it. Those who deny the ossific power of the periosteum maintain that in all such cases, whether resulting from injury purposely inflicted with the view of experiment, or proceeding from diseased action, a portion of the old bone remains alive, and serves as the germ of a new one; that, in short, the formation of a new bone is simply an expansion or growth from the remnant of the old one; and that, if merely the extremities of the bone affected remain alive, they will prove sufficient for generating the substitute shell.

It is difficult to reconcile this explanation with the rapid growth and uniform thickness of the new bone; since, if its formation proceeded from the extremities, the process should be slow and progressive toward the center; but there is another objection still more conclusive against it. If the new bone is formed by a portion of the old one that remains alive, then the removal of a part by mechanical means should be supplied from the same source. But in all the cases where this has been done, either in the way of experiment or for the cure of disease, the loss of substance, unless of small extent, has been found imperfectly repaired. For instance, after the operation of trepanning the skull, the aperture in the bone, though it becomes diminished in extent, is not altogether obliterated, and the newly-formed bone is not only smaller than the portion removed, but also thinner, as may be seen from the specimens now produced.

In the fore-legs of dogs and rabbits there are two bones of nearly equal size, and so connected, that a large portion of one may be taken away without destroying the rigidity of the limb. There is here, therefore, a convenient opportunity of trying what can be done by the extremities of a bone for restoring losses of substance in its shaft. Experiments of this kind have accordingly been frequently performed on these animals, and the result has uniformly been, that when the portion removed exceeded an inch in length, there was a permanent deficiency of osseous substance, the ends of the bone being merely produced toward each other in a conical form, and connected together by a tough ligamentous texture.

CASE.

W. M., aged thirty, glazier, on the 30th of November last fell from a window of the Physicians' Hall in Queen Street, about thirty feet from the ground, and sustained a compound fracture of the left leg, for which he was carried to the Hospital. The tibia alone had suffered, being broken transversely about the middle, but must have received a severe shock, as its surface became bare to the extent of several inches, and showed that there would be an extensive exfoliation. At the end of six weeks the discharge, which had all along been profuse, appeared so disproportioned to the strength of the patient, who was greatly emaciated, and apparently threatened with the irritative fever which precedes sinking—that amputation seemed requisite as a prudential measure, while it was at the same time ascertained that the bone had died throughout its whole thickness, and thus rendered the operation indispensably necessary. For, although the patient might possibly escape the danger of longer delay, it was evident that in the event of his doing so, the limb could not be of any use to him from the deficiency of bone. It was therefore removed.

It was long ago ascertained by Sir A. Cooper that in a limb provided with two bones, a loss of substance in one of them—unless its extent be very limited—does not admit of osseous reparation; all that can be done toward it being a sort of conical prolongation of the divided extremities, with a ligamentous connection, leaving a gap at the part. If, therefore, while the fibula remains entire, a considerable portion of the tibia, including its whole thickness, is removed, the result will be a false joint, rendering the leg useless. In the Anatomical Museum of the University there are preserved the bones of one that was amputated on this account—after the wound had completely healed—from the patient finding it worse than useless; and the same condition results when a large portion of bone dies from inflammation before the foundation of a substitute is sufficiently established, as happened in the case here represented, where I advised amputation at an early period, but was not allowed to perform it until my prediction of what would happen had been realized.

It may seem surprising that in a case of necrosis, such as the case just mentioned, where the exfoliation, though extensive, did not comprehend the entire bone, the reproduction should have been so incomplete, while on other occasions of the same disease we find the whole shaft dead, and inclosed in a new osseous shell quite sufficient to supply its place. At no distant date it would not have been easy to explain this diversity of result satisfactorily, since the opinions enter-

tained in regard to the reproduction of bone were very unsettled and conflicting.

Fig. 17.

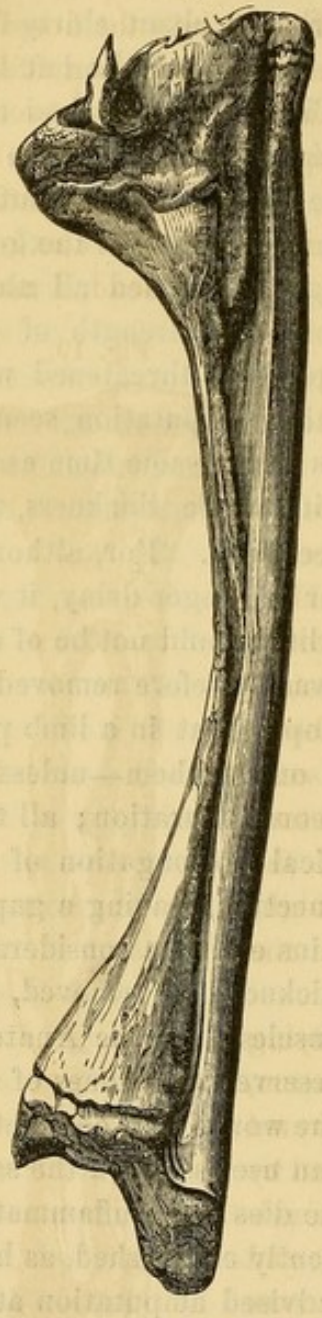


Fig. 18.

Some of those pathologists who deny the ossific power of the periosteum, and claim the whole production of new osseous substance for the bone itself, have attempted to explain away the difficulties which have just been stated, by supposing that in cases of necrosis, where a new bone is formed, the old one, in consequence of the increased action preceding its death, may determine the effusion of organizable matter into the surrounding soft textures, which will serve as a matrix or foundation for the new shell, and be ready to take up the ossifying process so soon as it is communicated from the surviving extremities

of the bone. That the process of reproduction may be accomplished in this way I am not prepared to deny, but that it is not necessarily, or always so performed, will, I think, appear from the following case:

In the month of March, 1835, a girl was brought into the hospital and placed under my care, on account of intense inflammation affecting the leg and ankle, consequent upon a sprain sustained a few weeks previously. Finding the joint in a state of suppuration, and the tibia bare through nearly the whole of its extent, I deemed amputation requisite, and performed it accordingly. Then wishing that the gentlemen present should see how completely the bone was dead, I made an incision along the shin, through the openings that had been made for the discharge of matter; and upon introducing my finger, was surprised to find the resistance of a firm substance in the soft parts, which careful inspection revealed to be an osseous deposit in the periosteum — not proceeding from the bone, but in detached portions, which, if the requisite time had been afforded, would obviously have coalesced, so as to form a shell surrounding the old shaft. Although this observation appeared to me quite conclusive, and sufficient to render any additional proof unnecessary for establishing the long-disputed power of the periosteum to form new bone, I thought it might be satisfactory to make some experiments on the subject.

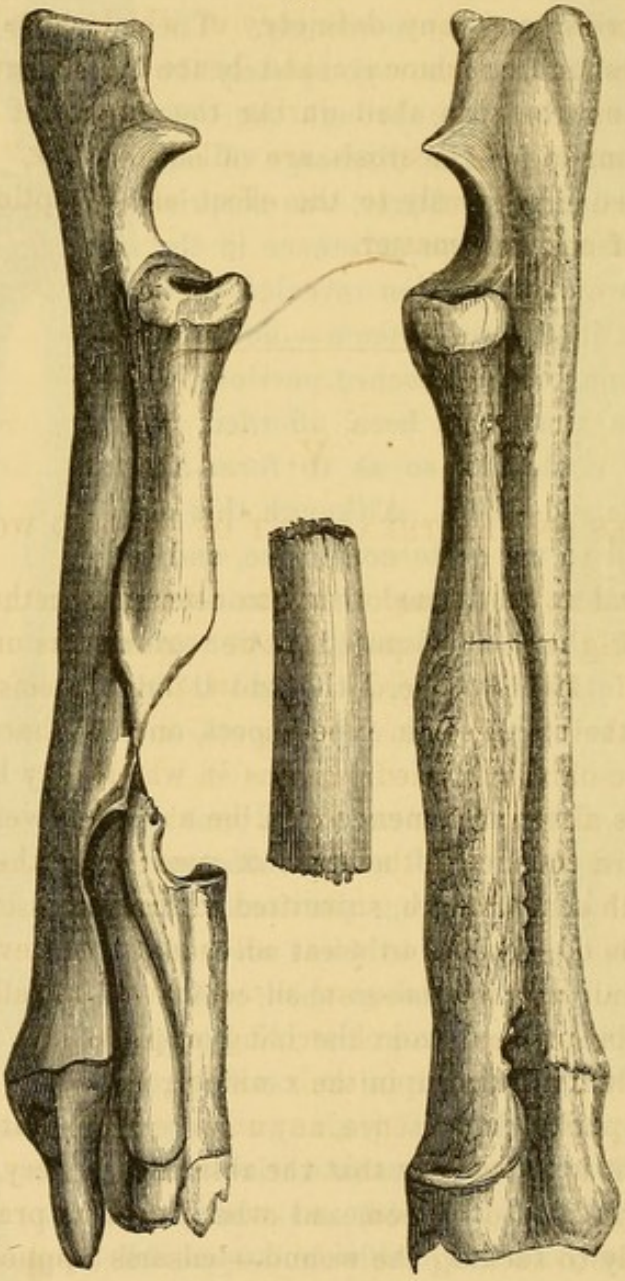
Fig. 19.

There is here, then, an instance of a bone dying suddenly in consequence of acute inflammation, without any thickening having previously formed in its neighborhood, and nevertheless succeeded by the production of a new osseous shell, which evidently could not proceed from the old bone, and no less evidently depended upon an ossific process resident in the periosteum.

As Nature is not capricious or variable in her proceedings, I regard this case as sufficient of itself, without any further evidence, to establish the ossific power of the periosteum. But, with the view of making the matter still more clear, I repeated the operation of Sir A. Cooper upon the fore-leg of a dog, and at the same time performed it upon the other leg, with the difference of preserving the periosteum,

which was slit open, and held aside, while an equal portion of the bone was removed. At the end of six weeks, instead of the gap presented by the first leg, I found, as here represented, a solid mass of bone. I then detached the periosteum in another dog, without removing the bone, and inserted a piece of tinfoil under the membrane, in which, at the end of a similar period, I found a thin plate of bone.

Fig. 20.



Since that time, my eyes being opened to the truth, I have met with many confirmations of it in the human subject suffering under various forms of disease; and, in the case which has led to these remarks, there was a circumstance well worthy of notice with this view,—as

the periosteum lying under the exfoliation had in its substance a thin piece of bone quite unconnected with the old one.

New bone may be formed, to a certain extent, by growing out from the surface of the old one, so as to lessen the size of an aperture,—such as that made by trephining the skull, or diminish the distance between two extremities, where there has been a loss of substance in one of the long bones; but when produced copiously, as in a case of necrosis where there is complete restoration, its formation certainly takes place in the periosteum—any deficiency of which curtails its production to a corresponding amount: and hence the irregular apertures observed in a new osseous shell during the period of its formation, which in the language of necrosis are called "*cloacæ*," and were formerly attributed erroneously to the effect of absorption, induced by the presence of confined matter.

V.

REMARKS ON THE TREATMENT OF INCISED WOUNDS.*

Any proposal at this time of day to alter the method usually followed in treating incised wounds, may be regarded as unnecessary and presumptuous. British surgeons, I know, pique themselves upon the excellence of their practice in this respect, and will hardly be induced to abandon the old-established customs in which they have been educated. But as all improvement would be at an end were such considerations allowed to silence the voice of conviction, the following remarks are, with all deference, submitted to the profession.

When it was the fashion to treat all wounds, however simple and disposed to heal, with an elaborate succession of so-called mundifying—digesting—incarning—and cicatrizing applications, most of which were more or less escharotic in their nature, but at all events effectually prevented, by their presence, any union except that established by granulation—it is no wonder that the results of a very different plan, followed by quacks, old women, and other irregular practitioners, who trusted entirely to sucking the wound—balsams applied externally—and incantations—made a deep impression upon people in general, and even the members of our own profession, who were at length induced not only to make themselves acquainted with the proceedings

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* Edinburgh Medical and Surgical Journal, 1827.

in question, but also to adopt them for the benefit of their own patients.

The success met with was great beyond expectation. It was discovered that wounds could be healed much more simply than had been imagined—and "union by the first intention" became so favorite an expression with the learned as to afford subject of ridicule to the vulgar.

Many succeeding anatomists and surgeons have investigated the action concerned in primary union. But it is odd enough that, while our ideas have been gradually becoming more and more enlightened as to the process of simple adhesion, our practice has suffered little alteration, and still continues to be tinctured with much of the old superstition and rudeness.

Every incised wound, whether accidentally or intentionally inflicted, after being dressed with plasters and ointments, is bound up with a long bandage. And although the patient soon complains of heat, pain, and oppression, his intercessions for relief are of no avail; the bandage must not be disturbed until the morning of the fourth day, when the long-wished for, much-dreaded dressing is to take place. Now it is easy enough to understand why the quacks of old tied up their patients' wounds for a definite period. They wished to keep at a distance the injurious applications so much confided in by the regular faculty; and for this purpose pretended that their balsams and incantations could work successfully only in secret. At the same time, prudence dictating the propriety of restraining anxiety and impatience no longer than what was absolutely necessary, while experience taught them that union by the first intention, if it happens at all, does so within three days,—they fixed upon this as the term of their mysterious process.

But we know that adhesion depends on a peculiar living action,—not upon the virtues of balsams or superstitious observances; and why then do we still obstinately defer the dressing of wounds so long? It may be said by those who do not feel prepared to answer this question, the practice succeeded of old, it does so now; and we are satisfied without troubling ourselves to seek for reasons. But is the practice really successful? Does the surgeon uniformly or even frequently find, when the dressings are first undone, that the wound is healed? To both questions, I answer decidedly in the negative.

When the surgeon with his apprentices, the patient with his friends, are all assembled together on the morning of the fourth day, an anxious and painful scene ensues. Plasters and bandages, warm water and sponges, being duly prepared, the bandage is cautiously undone—no

easy matter frequently, when dried blood has glued its different crossings together, and fixed the pins into their places—then compress by compress is taken away, until the wound lies exposed to view—when pus, which has separated its lips, is seen lying in considerable quantity between the wound and plaster; or, while the surgeon and by-standers flatter themselves that union has taken place by the first intention, a gush of fetid pus soon puts an end to their premature congratulations. In both cases, it is plain that the corresponding surfaces, instead of being united by primary adhesion, must be as completely detached as if lint had been interposed between them. Indeed, the French practice is much more prudent than our own; for, laying their account with the formation of pus, they provide a drain for its discharge, and thus prevent the formation of those artificial, frequently extensive and undermining abscesses, which so often result from injudiciously conducted attempts to obtain adhesion by the first intention.

That in this description I have not made matters worse than they really are, will be allowed by all who have seen much operative practice. Many students have assured me, that in the whole course of their hospital attendance they never saw an instance of union by the first intention,—except in cases of cancer or hare-lip, and venesection. And I have ascertained that some do not know what is properly meant by this term, saying, for instance, that a stump which got well in the course of three or four weeks without sloughing or exfoliation, healed by the first intention, though it may have been suppurating freely all along.

Blood being effused from the raw surfaces, and having no opportunity of escaping, causes separation and distention. Adhesion is consequently prevented, and the parts are roused to a stronger action; then the patient complains of pain and heat, with thirst, and all the other symptoms of fever—pus is formed, and the abscess is completed. It is not necessary, for the prevention of adhesion, that *blood* should be effused into the cavity, since the uniting action is always for the first day, and part at least of the second, attended with a copious discharge of thin serous fluid, which, if retained, acts quite as effectually in preventing the surfaces from adhering; that is to say, if they be of any considerable extent—for in very small wounds primary union happens, do what we will to oppose it. This copious and continued discharge of serous fluid during the adhesive process is what I am most anxious to impress upon the reader; for if this main fact be kept in mind, there can be little difficulty in perceiving why the sealing up of wounds should be the most certain means of keeping them open, or in determining as to the best means of bringing about a different result.

It is plain, that in the first instance no attempt should be made to close the orifice completely—that pressure should be directed to the bottom rather than the outlet of the wound—that blood should not be allowed to crust over the lips; for though blood may be the best, that is, the least hurtful balsam, I have often known it confine the serous discharges, and so prevent union—and that the orifice should be wiped and kept dry as long as it exudes any moisture.

For attaining these objects, I would recommend in the first place, that when means are required for keeping the cut edges in contact, stitches should be preferred to adhesive plaster, since their effect is exerted at considerable depth, while they offer little or no resistance to the exit of fluid. Some surgeons employ stitches and plasters together, but this plan is objectionable; for plasters acting only on the surface, always tend to close the lips, or even turn them inward, while they not only effect no deep pressure, but even render the parts concerned more loose and disposed for the formation of sinuses; and stitches, if put in close enough, may always be rendered equivalent to the effect required. It may be noticed, however, that a little gaping of the edges is by no means hurtful in the first instance, since it insures a thorough discharge, and may be rectified as soon as adhesion begins.

Secondly, I would advise the disuse of all long, complicated bandages, which cannot be tightened or slackened in part, and removed without disturbing the patient.

Compresses having been laid along the sides of the wound, it will be easy to effect pressure by very simple means, independently of long circular rollers. For instance, in wounds of the trunk, nothing can be more convenient than a broad piece of linen, long enough to cross a little over the breast, and having its two ends torn longitudinally into three or four portions, any one of which may be tightened or slackened as occasion requires, while the whole may be thrown back at a moment's notice.

For wounds of the extremities, a similar bandage, on a smaller scale, will answer equally well; and as for stumps, I beg to recommend a very simple contrivance, that has often saved me much trouble. A roller is put on as usual, from above downward, until it has come within a few inches of the stump; and then a few narrow strips of cloth being pinned or otherwise attached on each side, nothing remains to be done but tying them to each other across the face of the stump.

Lastly, I would advise that the surgeon should apply dry lint over the wound as often as the least moisture is perceived.

If these directions be observed, I feel satisfied that union by the

first intention will become an ordinary occurrence. And of how much consequence this is in most cases of wounds, surgeons need not be told by me.

The reader of this paper, which was published two and twenty years ago, may probably recognize some principles of treatment that since then have been recommended to the profession without any allusion to preceding observations. At the time when this paper originally appeared, my practice was to delay the dressing of wounds until the evening, or at least until several hours had elapsed after their infliction, lest distention should be caused by the bloody or serous effusion being retained by immediate approximation of the lips, even though not covered by any impermeable material. But finding that this method proved inconvenient by disturbing the patient, and by sometimes causing a renewal of the bleeding, I have for many years endeavored to adopt measures, in the first instance, consistent with what seemed to be the proper principle of treatment, and free from the objections just mentioned.

The great essentials for primary union appearing to be approximation of the raw surfaces sufficiently near to place them within reach of the adhesive action, and prevention of their displacement by the accumulation of fluid between them, the different circumstances of wounds afford room for varying the modes of their management. In those penetrating the mouth through the cheek or lips, the cavities of the trunk, or the joints, the raw surfaces may be at once accurately brought together at their external edges by the interrupted or twisted suture, without any risk of subsequent separation by fluid effused between them, since there is space for its reception at the inner side of the wound. But in wounds opening upon only one surface, and more especially those of considerable depth, or situated in parts opposed to accurate coaptation, the dressing should be applied with a view rather to compress the sides of the cavity than to close its orifice. Stitches may be employed to assist in regulating the position of the cut edges, but not so as to confine them in close contact; and compresses of dry lint, or other bibulous material, must be carefully employed to retain the raw surfaces in due position, without impeding the discharge of blood or serum. One or more soft and moist, and carefully squeezed sponges, I find extremely convenient for this purpose, especially in regions of the body where the textures, entering into the formation of the parts concerned, are such as to impede the efficient action of pressure. After removing tumors from the upper or lower triangle of the neck, in the neighborhood of the parotid gland or clavicle, I have by this means obtained union by the first intention, when it could

hardly have been expected. In amputations at the ankle-joint, I have in like manner experienced great advantage from a hollow sponge, sufficiently large to receive and contain the stump.

VI.

ON THE PROCESS OF GRANULATION.*

It is a common remark, that the things which lie most within our sphere of observation are least attended to, and there is no better illustration of this than the subject which I now propose to discuss. Every wound, when it does not unite by the first intention, and every ulcer, if it heals at all, heals by granulation, and yet nobody takes the trouble of inquiring into the precise nature of this process, every one being satisfied with the vague account of it which is to be found in surgical books.† The statement generally contained in these is, that lymph, being effused on the surface of an abscess, wound, or ulcer, becomes organized, and formed into a layer of small, red-pointed, fleshy granulations; from these pus, together with coagulable lymph, is secreted, and the new crust of organizable matter is in its turn converted into granulations. "In this manner layer after layer is formed, until the cavity is filled up."‡ Such is the explanation usually given, and as generally considered satisfactory.

Instead of attempting to disprove the accuracy of this description of the mode in which losses of substance are repaired, I will at once endeavor to show that the alleged reproduction does not really occur; that the appearances which are thought to establish its reality are delusive; and that, therefore, the explanation employed to account for it is equally unnecessary and erroneous.

The subject of Reproduction or Incarnation engaged the attention of the French Academy of Surgery; and the memoirs of its members, Fabre and Louis, leave little wanting with regard to its history. How they have happened to be so completely forgotten in modern times as to permit the old doctrine of regeneration to revive and flourish, to the suppression of the truth, I cannot tell; but I shall attempt to place the matter once more in a clear point of view.

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* Second Report of the Edinburgh Surgical Hospital, 1829. Edinburgh Medical and Surgical Journal, 1830.

† This was written in 1829.

‡ Sir Astley Cooper's Lectures, vol. i. p. 161.

The arguments in favor of reproduction by granulation are, 1. the regeneration of lips, tongues, and the glans penis, completely or partially destroyed; 2. the filling up of abscesses or sinuses; 3. the healing of wounds attended with loss of substance.

When we come to inquire into these alleged proofs, we find that of regenerated lip there is only one instance on record; and if M. Louis's account be correct, not much weight ought to be placed on it. Louis says, that M. Pibrac and he were invited to visit this famous lip, in order to satisfy themselves of its actual regeneration. The loss of substance, they were told, had been so great that it was impossible to unite the cut edges; that it had even been necessary after the excision to apply the actual cautery to the roots of the disease; that eventually the patient was cured; that the lip was restored; and that they should be lost in admiration of this wonderful work of nature. "We visited the patient," says he, "and saw nothing at all extraordinary. The patient had been freed from a tumor, the extirpation of which might at first sight have seemed to require removal of the whole lower lip. But it is well known that when a part is much swelled, a large portion may be taken away without diminishing its natural extent; and this is just what had happened in the case under consideration. The lip, properly speaking, was completely wanting, so that the teeth and gum appeared through the breach. *The loss of substance had not been repaired.* A perpendicular cicatrix denoted that the lower part of the wound had been closed by the union of its edges. The patient was unable to retain his saliva, and the skin of the chin, which had been drawn up to supply the lip in part, and which had been mistaken for the product of regeneration, was covered with its characteristic *beard.* The great breach caused by the operation had been in some measure closed by contraction, but not one particle of the lost substance had been regenerated."

If this be the true account of the lip, I certainly feel inclined to agree with M. Fabre, that the "well formed proportioned glans," which Mr. Jamieson of Kelso had the pleasure of seeing reproduced after "amputating the balanus preputium, and a small portion of the corpora cavernosa penis," was nothing more out of the ordinary course of nature than the original glans itself, which had been concealed from sight by the swelled and gangrenous prepuce. If the alleged reproduction admits of this explanation in regard to the lip and glans penis, it is evident that we should pay little attention to the evidence afforded by the separation of sloughs from the tongue, where it is so difficult to ascertain the extent of destruction, and also of restoration, owing to the great extensibility of the tissue composing this organ.

As to the filling up of abscesses, it ought to be recollected that the cavity which contains the pus is not formed by the destruction of any tissue, but by distention of the skin and subjacent organs, whence evacuation of the fluid is followed immediately by such collapse and approximation of the surrounding parts as nearly obliterates the hollow. And where there is really a destruction of cellular substance, as in the abscesses of weakly children, a permanent depression remains after the cure is completed. Sinuses are healed on the same principle, viz., by coalescence of the sides; and every attentive practitioner must have observed the great advantage of laying them together by means of proper bandages, so soon as they are disposed to unite.

Lastly, as to the healing of ulcers or wounds attended with loss of substance, it is well known that the resulting cicatrix is always smaller than the original sore; and that there is invariably a depression of it proportioned to the destruction of parts. M. Fabre quotes the case of a wound in the thigh destroying the muscle and exposing the bone, the cicatrix of which rested directly on the bone without the interposition of any newly-formed substance. It was a similar case which led my attention to this subject. M. Bezoet of Rotterdam, who wrote against the doctrine of reproduction, appeals to a case of wound in the head, where a portion of the scalp was removed, and where, notwithstanding the most luxuriant granulations, the cicatrix rested on the bone. I have in my possession several skulls, with the scalps, from which portions of bone had been removed, artificially and naturally. One of these belonged to a gentleman who was attended by myself, and in all of them the cicatrix is but a pellicle resting on the bone or *dura mater*.

When amputation was performed in the old way, by cutting directly through all the parts, a very large granulating surface resulted, which ought to have become larger if there really was a growth of new substance, so as to form the stump into a bulbous figure. But it always happened, on the contrary, that the cicatrix was much smaller than the wound, and that the stump, so far from being bulbous, was of a sugar-loaf or conical form.

We have frequently an opportunity of dissecting a granulating sore after death or amputation. And do we then find any such appearance as the common description would lead us to expect? Do we find successive layers of granulations, or any considerable thickening of newly-formed substance? I have made many such examinations, and could never perceive anything but a thin layer of organized matter covering the surface.

How, then, are wounds healed by granulation?

Lymph being effused over the surface and organized into a granular pellicle, lymph and serum are effused into the subjacent cellular tissue so as to distend it more or less. In what is called a healthy granulating ulcer, the quantity is very small, so as hardly to affect the elevation of the surface, or induration of subjacent parts; but when the process proceeds in a morbid manner, then many remarkable phenomena are thus induced.

For instance, when the ulcer is defective from weakness, the granular surface is distended by effused serum under it, and elevated into soft spongy projections, the proud flesh of the vulgar. This œdematous state of the sore is usually accompanied by a similar condition of the limb or other part in which it is seated; no trace of these fungosities is to be found after death; pressure restrains them as effectually as it does the œdema of the limb; and they suddenly subside under the action of what are called escharotics, without leaving any remains in the place they occupied. These observations afford satisfactory evidence of their real nature, which I had lately an opportunity of illustrating still more convincingly. William Brown entered the hospital on the 27th of October, to obtain relief for a most extensive and frightful sore of the leg. It had existed for seven years—it stretched from the middle of the calf, on the back and both sides of the limb, to the heel. There was great general swelling—enormous fungous growths —complete inability of motion—in short, such a formidable appearance as led the patient, and most of the medical men who saw him, to conclude that amputation afforded his only chance of remedy. A large blister was applied, and the state of matters soon underwent an extraordinary change for the better. The swelling of the leg subsided —the fungosities disappeared, and the sore, now greatly diminished in extent, assumed a healing appearance. At the end of two weeks from his admission, I desired him one morning to try if he could walk. When he had accomplished a few steps, I observed the blood trickling from the ulcerated surface; and, on observing it more closely, discovered a number of dark-colored eminences which had not existed previously. They varied in size from that of a pea to that of a nut. When squeezed roughly they suddenly burst, and collapsed with effusion of blood. When pressed more gently, the pellicle forming them could be distinctly traced over the adjacent granulating surface, where a similar appearance was produced by the blood forced out of the little tumors formed in the first instance. It is difficult, I think, to conceive a more satisfactory proof of the true nature of a granulating surface than this observation; which I am very much surprised should not have been made before.

In those sores, again, which have something specific in their action —something capable of contaminating other parts of the system, either by absorption or extension of action, there is an effusion of lymph into the subjacent and surrounding cellular substance, which occasions the indurated and elevated edge so characteristic of such sores.

In other ulcers, as those occurring in scirrhous and medullary sarcomatous textures, lymph is effused under the granulating surface, and, becoming organized, elevates it into fungous excrescences. And here I dare say it will be asked, If morbid structures are produced, why cannot the healthy tissues be regenerated? To which I answer by asking, Since the legs of salamanders and lobsters are reproduced after removal, why are not the limbs of man also reproduced? In studying the operations of nature, we ought always to prefer facts to mere reasoning.

The granular surface being formed, so as to seal up the interstices of the body and serve as a temporary integument, the process of healing proceeds by leveling the sore with the surrounding skin. The slight effusion which, as already mentioned, takes place under the granulations, assists in this; but the effect is chiefly produced by absorption, consequent emaciation, and shrinking of the surrounding tissues, especially the fat. So soon as the surface of the ulcer, or the edge of it at least, is on a level with the skin, the absorbing process goes on more rapidly, removing the interstitial particles of the granular pellicle and subjacent tissue, and thus diminishing the area of the sore. In illustration of this part of the process I may remark, what every attentive surgeon must have observed, that the cicatrix of ulcers is smallest in those parts of the body where the integuments are most lax, as the scrotum, the abdomen, the mamma; and that it is largest where the skin, from its firm connection, is most unyielding, as the thorax, the cranium, the shin, etc.

The cicatrix is formed of the granular pellicle and subjacent cellular substance, which has been indurated by the effusion of lymph into its areolæ. Its thickness varies with circumstances, but always diminishes after the cure seems to be completed; whence, though on a level with the surrounding skin when first formed, it ultimately becomes lower, so as to constitute a depression; but this appearance is no doubt partly owing to the surrounding parts recovering from the emaciation, which, as above mentioned, takes place in the first instance as a step toward the cure.

VII.

TUMOR OF THE OS HUMERI REMOVED WITHOUT AMPUTATION.

Next to the lower jaw and the thigh-bone, there is no part of the osseous system so frequently the seat of morbid growths as the humerus. They may be either firm and fibrous or soft and cerebriform, but whether of the one kind or the other, with exception of the simple exostosis, have hitherto been always regarded as irremediable except by amputation. In the following case I pursued a different course, which, if adopted at an early period of the disease, may render so serious a mutilation less frequently necessary.

T. G., aged forty-three, from Alva, was admitted into the hospital on the 9th of November, 1860, suffering from a tumor of the right shoulder. It was situated under the deltoid, being about the size of a hen's egg, divided longitudinally, and having a very firm consistence, hardly distinguishable from that of the bone to which it was inseparably attached. The patient stated that he had felt pain in the bone about six months before, and had not noticed the swelling until a considerable time afterward, since which it gradually increased in size, with a corresponding aggravation of pain.

Unwilling to propose amputation at the shoulder-joint for a condition so little formidable in appearance—while there could be no doubt that this severe measure would in course of time become requisite if the disease were allowed to advance until it assumed a more serious aspect—I considered the practicability of affording relief in another way, and took for my guide the principle of practice which has been so well established in regard to tumors of the jaw. This is, that nothing more is required for an effectual remedy in all curable cases than removing the morbid growth, so as to divide the bone in a sound part beyond the confines of the disease. The cases of maxillary tumors, which, when formerly treated by means of gouges and cauteries, applied directly to the seat of disease, uniformly proved miserable failures, are now remedied with such facility and certainty as contrast very favorably with the inefficiency of surgery in this department at no very distant date. Having thus reason to expect that removing the upper extremity of the humerus would be sufficient for the purpose in question, and knowing from the results of similar operations for caries that the arm, notwithstanding this shortening of the bone, would not be materially lessened in usefulness, I adopted the following procedure:

On the 14th I made an incision from the coracoid process downward to the extent of about four inches, opened the joint, detached the muscular attachments from the tuberosities of the humerus, protruded the head of the bone through the wound, and sawed it off below the tumor, which was found to consist of a thick cyst, partly osseous at the base, and containing small cysts in its substance, resting on a rough and spicular slightly excavated surface. No vessels required to be tied, and the patient suffered hardly any local or constitutional disturbance. He was dismissed on the 4th of January, 1861, and I saw him lately in perfect health, with the wound soundly healed, and an arm perfectly strong and useful from the elbow downward. When the muscles become shortened, they will, I have no doubt, restore command over the shoulder-joint also.

As morbid growths of the humerus almost always originate from the head or its immediate vicinity, it seems probable that if the disease could be recognized at an early period of its progress, there would not unfrequently be an opportunity of affording effectual relief without resorting to the extreme measure of amputation. Thus, a tumor, the largest it is believed on record, growing from the humerus, which I removed with complete and permanent relief, although weighing nearly fourteen pounds, left the lower half of the bone perfectly unaltered. It must have commenced in the head, which was expanded into an enormous mass, of a cup shape, inclosing the glenoid cavity and neighboring part of the scapula, so that in its infancy this tumor might certainly have been removed without taking off the arm. Indeed, if even a third part of the bone required to be taken away along with the tumor, I should think it better to do this than amputate at the joint, since, if the muscles did not become shortened sufficiently to restore useful action of the shoulder, the hand and fore-arm would at all events be completely serviceable. Many years ago, a fine healthy-looking boy from Kirkcaldy came under my care, on account of a tumor, the size of a small orange, seated, contrary to custom, about the middle of the humerus. As it was very firm, and obviously of a fibrous or fibro-cartilaginous and non-malignant nature, I felt unwilling to amputate the arm, and therefore having exposed the growth by a free incision and separation of the muscles, I applied the cutting-pliers obliquely, first at one side of its base and then at the other, so as to effect detachment, but not without dividing the whole thickness of the bone, and consequently causing the formation of a false joint, which nevertheless did not prevent the patient, who grew up to vigorous manhood, from using his arm, through the assistance of a leather case that was buckled round it.

In connection with this subject, I may mention the case of a gentleman, who, not long ago, was placed under my care on account of a fibrous tumor engaging the whole extent of the metacarpal bone of his thumb. In the hope that it might be of service as an opponent to the fingers, even though deprived of its supporting bone, I cut out the tumor by disarticulation at both of its extremities, with the most satisfactory result, not only in regard to appearance, but from the hardly diminished usefulness of the hand.

VIII.

AMPUTATION AT THE ANKLE.

Caries is frequently seated in the articular surfaces of the joint between the astragalus and os calcis, where it may seem to be of limited extent, and occasion no formidable symptoms, but nevertheless exhibits its characteristic obstinacy, and resists all means of remedy except amputation. A succession of such cases painfully impressing me with the imperfection of surgery which afforded no milder means of remedy than removal of the leg, suggested the idea of operating at the ankle, so as to preserve the thick integuments of the heel, and lessen the extent of mutilation.

J. W., aged sixteen, recommended to my care by Mr. Aitchison of Dunbar, and admitted into the hospital on the 5th of September, 1842, afforded me an opportunity of trying this plan. He was suffering from disease of the foot, which, in consequence of a sprain sustained twelve months before, had suppurated and ulcerated, so as to admit a probe into the joint between the os calcis and astragalus. I performed the operation without any difficulty, and as the ankle-joint remained sound, did not remove the articulating surface, further than by taking away the malleolar projections of the tibia and fibula. The patient went home on the 2d of December, and did well afterward, as appears from the following extract of a letter which Mr. Aitchison sent me four years subsequently to the operation: "He tells me he suffers no inconvenience from the stump, or the slightest tenderness. He has become a country tailor, and has often ten or fifteen miles a day to go to his work. He also says that with a few of his young companions he ran off to see the operations of the North British Railway at Penmanshiel tunnel, and must have walked fully thirty to thirty-five miles."

The result of this case is very encouraging to the performance of

amputation at the ankle-joint—an operation of greater importance than at first sight may appear, since, if found to be practicable with safety and success, it should in a great measure supersede amputation of the leg below the knee. The circumstances requiring the last-mentioned operation seldom affect the leg itself, because, if so seriously injured or diseased as to require amputation, it must almost always be removed above the knee But while compound fractures and malignant tumors of the leg are thus in general subjects for amputation of the thigh, diseases and injuries of the foot have too frequently led to amputation of the leg. Modern surgery, no doubt, has circumscribed this field for the operation, by introducing partial amputations of the foot; but there still remain cases of no rare occurrence, which are held to demand its performance.

When caries attacks the metatarsal articulations of the toes, it is usually confined to a single joint, that of the great toe being the one by far most frequently affected; and Mr. Liston's happy employment of straight cutting-pliers, instead of the variously formed saws previously in use, for dividing the bones, has rendered removal of the disease from this situation so easy, that the old practice of amputating the leg on such occasions seems hardly credible. If, again, the caries be seated at the other or proximal extremity of the metatarsus, it is sure to engage also the adjoining tarsal bone or bones, and therefore the operation suggested by Mr. Hey, of Leeds, which was to disarticulate the metatarsus from the tarsus, is not applicable. In many cases, however, as only one of the tarsal bones is engaged, it may be taken away with the corresponding part of the metatarsus, so as to render the foot merely narrower without diminishing its length. Thus the first metatarsal is removed along with the internal cuneiform bone, and the os cuboides with the two metatarsal bones articulated to it. But the operation of Chopart, which leaves only the astragalus and os calcis, is the most valuable of all partial amputations, as it commands the largest portion of the foot requiring removal for disease or injury, and at the same time preserves a support for the patient not less useful than that which is afforded by the whole of the tarsus. Its introduction was long opposed on the ground that the extensor muscles of the ankle acting through the tendo achillis, when no longer antagonized, would draw up the heel and point the cicatrix to the ground. I performed this operation in 1829,* so far as I know for the first time in Edinburgh (Great Britain?), and have frequently done so since,

* Quarterly Report of the Edinburgh Surgical Hospital. Edin. Med. and Surg. Journal, 1842.

with the most satisfactory result, no inconvenience having ever been experienced from the source just mentioned, as the cut extremities of the tendons on the fore part of the joint speedily acquired new attachments, enabling them to counteract the extensive power.

But when caries affects the astragalus, or os calcis, or, as very frequently happens, is seated in the articular surface between these bones, no form of partial amputation can be of any avail, and attempts to cut out the diseased bone generally prove unsuccessful. In cases where the tuberosity of the os calcis is alone affected, excision may be executed completely and certainly; and it is sometimes, though rarely, possible to extirpate the disease, even when it extends to the articulation, either directly by gouging out the carious part, or by making a perforation through it across the foot, and passing a seton, which may be made the vehicle of suitable applications, such as the red oxide of mercury, the mineral acids, or a saturated solution of the nitrate of mercury. When these means fail, or are abstained from, in despair of their efficiency, amputation of the leg is the ordinary resource, and the same measure is of course considered necessary for similar disease of the ankle-joint. In the case of compound dislocation of the astragalus, with or without fracture of the malleoli, it is deemed proper, in the first instance, to give the patient a chance of retaining his limb: unless his habit of body, or the circumstances in which he is placed, should be unfavorable for his recovery, when prudence is thought to require amputation of the leg.

It thus appears that compound dislocation of the astragalus, and caries of this bone and of its adjoining articulating surfaces, are the principal cases for amputation of the leg, and that consequently this operation may usually be superseded by amputation at the ankle-joint. It may be objected that, when the joint itself is diseased, entire removal of the articulation must be requisite. But in what is commonly called disease of the ankle, the joint between the astragalus and os calcis is affected much more frequently than that between the astragalus and bones of the leg; and even when the latter condition really exists, it would be easy to remove all of the bone that is essential for recovery, by sawing off a slice from the articulating extremities of the tibia and fibula, as the caries penetrates to no great depth in the cancellated texture.

The advantages promised by amputation at the ankle-joint, instead of the operation near the knee, are: 1st. That the risk of life will be smaller; 2d. That a more comfortable stump will be afforded; and 3d. That the limb will be more seemly and useful for support and progressive motion.

The risk of life must be less, because the parts removed are not nearly so extensive as when the leg is amputated, hardly exceeding, indeed, those concerned in Chopart's operation; because there is less room for hemorrhage, either immediate or secondary, owing to the smaller size of the vessels cut, which are merely the branches of the posterior tibial, and the anterior tibial artery, very near its termination; and because the cavities of cylindrical bones not being opened, the danger of exfoliation from the dense osseous texture, and of inflammation in the medullary veins, is avoided. The stump will be more comfortable, because it is formed of parts peculiarly well calculated to protect the bone from injury, and not disposed to contract like the muscular tissue; because the cut extremities of the nerves being smaller, will be less apt to enlarge and become the seat of uneasy sensations; and because the absence of exfoliation insures complete union of the integuments over the bone. And the limb will be more useful, as well as seemly, from full play being afforded to the movements of the knee-joint, without the embarrassment of an imperfect stump.

Very soon after the above case had succeeded so well, I was requested by Mr. Goodsir, now my respected colleague, to visit his friend Dr. George Wilson, the late professor of Technology, who was then laboring under a complication of ailments, which threatened to blight the expectations that his talents and industry had led all who were acquainted with him to entertain. I found his naturally feeble frame extremely emaciated and exhausted by pulmonary disease of an alarming character, and also by extensive disease of the left ankle-joint, from which there was a profuse discharge of matter, and so much pain as to prevent sleep, except under the influence of opiates. The pulse was quick, and the tongue dry. In these circumstances, it was obvious that unless relieved from the local disease he must soon sink under it; while, on the other hand, I could entertain no doubt that amputation of the leg would certainly prove fatal. I therefore proposed to operate at the ankle, and the patient readily assented to this, though fully informed as to the novelty of the proceeding. The operation was accordingly performed as upon the former occasion, but with this difference, that the extremities of the tibia and fibula being both diseased, were removed by the saw. The result will be best explained by the following statement, dated 9th June, 1846:

DR. WILSON TO MR. SYME.

Edinburgh, 9th June, 1846.

DEAR SIR:—You will remember that I lost my foot in January, 1843. The stump healed rapidly, and in six weeks had all closed,

except one small aperture, from which a slight watery discharge continued to come till the month of June, when it suddenly ceased, and complete cicatrization occurred. Since that period, I have experienced no pain or uneasy sensation of any kind in the stump, nor any tenderness making standing or walking irksome or unpleasant. I have very rarely experienced the feeling of the lost foot being still part of the body and the seat of pain, which is so common a complaint among those who have been deprived of limbs. For the last two years I am not aware that I have known this sensation at all; if I have, it has made no impression on my memory. I can lean the weight of my body on the naked stump without inconvenience; and, with a single stocking over it, am in the habit of walking through the house, when my boot is not at hand.

The artificial foot I wear, within an ordinary half boot, is made of light wood, with a spring across the part corresponding to the roots of the toes. This spring, however, is of no use, as the rigidity of the boot inclosing it prevents its acting. The foot might as well be made of one piece of wood. At the heel it is hollowed into a concavity, corresponding to the shape of the stump, but rising up before and behind into two prolongations, which, seen in section, would resemble the horns of a crescent. The foot is cased in chamois leather, which is carried up from the borders of the concavity, and cut into the shape of the upper part of a lady's cloth boot. Like it, also, it is laced up the inner side, and has a tongue; the latter is made of thick soft leather, and is of much service in securing the fitting of the foot. There are no straps or buckles, or steel supports of any kind, nor are they needed. From the bulbous form of the stump, and its circumference being considerably greater than that of the leg above it, the lacing of the upper leather completely suffices to hold the artificial foot on. It would be impossible, indeed, to pull it off without loosening the lace or tearing the leather.

The artificial foot, as originally furnished, was thickly padded; but I found the padding so apt to shift, and so liable to become uncomfortable from saturation with moisture, that I had it all removed. It is much more convenient to pad the stump, by covering it with two or more worsted or chamois leather stockings, which can be changed at pleasure. I use a stick in walking; but, except on rough causeways or very uneven ground, it is unnecessary, neither is it requisite in ascending or descending stairs.

The results of an inflammatory attack of the lungs made me a bad walker, nor have I ever ascertained how long a pedestrian journey I could achieve; but I have stood for six hours (not consecutively)

daily, for months together, without any inconvenience, and I wear the artificial foot, without intermission, from morning till bedtime.

Very sincerely,

GEORGE WILSON.

It may seem a startling, but it is nevertheless a true statement, that amputation at the ankle-joint, with hardly any exceptions, may, and ought to supersede amputation of the leg below the knee. In order to establish this position, it is necessary to show, in the first place, that the stump which results from the former operation is fit for the duties required of it; and, secondly, that the patient may, under the various circumstances concerned, be relieved as effectually in the one way as the other.

The idea of amputating at the ankle-joint is not new, the operation having been performed on the Continent by different surgeons before I thought of it; and it would probably ere now have become generally adopted, but for the doubt that was entertained as to the ends of the bones being sufficiently covered to afford the patient a comfortable and useful support for the limb. For my own part, when I read of dissecting flaps of skin from the instep, or sides of the foot, I felt so much distrust in the protection that could thus be effected, against the injurious effects of pressure on a part so exposed to it, that I had no desire to try the experiment. But it occurred to me that, by performing the operation in a different way, all such objections might be obviated. This was to save a flap from the sole of the foot and thick integuments of the heel, by making a transverse incision, and dissecting these parts from the os calcis, so that the dense textures provided by nature for supporting the weight of the body might be still employed for the same purpose. Two trials of this operation having proved satisfactory, I communicated them to the profession, and am glad to find that not only my colleagues in the hospital here, but also practitioners in other places, have already acted upon its recommendation. The additional experience of my own practice now enables me to suggest some improvements in the mode of procedure—point out an error to be avoided—and verify the expectation formerly expressed as to amputation of the leg being hardly ever required.

In proceeding to consider the circumstances in which this operation may be performed, it seems worthy of notice that, until a recent period, amputation of the leg was in this country generally resorted to for the removal of diseased bone when the part affected extended upward beyond the metatarsus. The operation of Chopart might frequently have accomplished all that was requisite, but unfortunately suffered

from a prejudice which opposed its adoption. This was, that the extensors of the heel, being deprived of antagonizing action, would point the stump downward, so as to render it useless as a support for the body. In 1829, for reasons elsewhere stated,* though there was no precedent for its performance in Edinburgh, I ventured upon this partial amputation of the foot, with perfect success, and without the slightest inconvenience of the kind anticipated. Encouraged by this result, I resolved to adopt the operation: and before long performed it six times with entire satisfaction. Since that time the operation has been established here, and regularly practiced in cases admitting of its application.

Although the introduction of Chopart's operation considerably abridged the field for amputating the leg, there were still two situations in which caries frequently occurs, where it was beyond the reach of any partial removal of the foot. These were the joint between the astragalus and os calcis, and the ankle-joint itself. In the former of these situations, the diseased bone is so near the fibular side of the heel that it is apt to seem within reach of the gouge or other means of extirpation; and attempts have often been made to effect this, but seldom if ever with success, owing to the caries extending along the complicated articulating surfaces of the bones affected. I have succeeded in such a case, by making a fair breach through the foot from side to side, and passing a thick seton, which could be made the vehicle of red precipitate and other escharotics; but even this treatment cannot be depended upon, and its failure, in a case where I had ventured to indulge hopes of success, led me to think of contriving a method of amputating at the ankle-joint which might afford relief under such circumstances, and afford the patient a comfortable stump.

Compound dislocation of the ankle-joint, either with or without that curious displacement of the astragalus which results from falling with great force on the heel, was formerly held to require amputation of the leg. The authority of Sir A. Cooper's experience encouraged attempts to preserve the limb in such cases; and in private practice both forms of the injury are now frequently conducted to a successful issue, though in general through a protracted process of recovery. But it must be admitted that many lives have been lost, especially in hospitals, from trying to retain the limb. In the Royal Infirmary, I find that of thirteen patients who had suffered compound dislocation of the ankle, and were not subjected to amputation, only two recovered; and even in the event of recovery, the foot generally remains in such a state

* Edinburgh Medical and Surgical Journal, October, 1829.

of stiffness, weakness, and sensibility of external impressions, as to be rather an incumbrance than a support to the patient. Now, all this danger, tedious confinement, and permanent discomfort might be obviated by amputating the foot in the first instance. So long as the only alternatives were an attempt to preserve the limb, and amputation of the leg, there was a strong inducement to abstain from operating. But if the patient's safety and speedy recovery may be insured by taking away merely that part of the limb which, in the circumstances, can be of little value either as to use or ornament, while at the same time a stump is produced in all respects preferable to a shattered, stiff, irritable foot—I think there should be little hesitation in resorting to amputation at the ankle-joint under the circumstances in question. I would certainly have done so in the following case, had I not been in the country on the day of the patient's admission.

Case I.

John Cameron, aged fifty-four, was admitted on the 11th of November, having on the morning of that day fallen, from a height of about twenty feet, into the hollow of a gasometer. There was a large rent in the instep of his right foot, through which the articulating surface of the astragalus protruded. It was replaced without any difficulty, and the edges of the wound were brought together. He did very well for a few days, but then became feverish, and complained of pain in the limb, which had become much swelled. Incisions were made with the effect of discharging matter and affording relief. He continued pretty well until the 25th, when he had a rigor followed by increase of fever. On the 31st he had another rigor, and his pulse, which had previously ranged from ninety to a hundred, increased to a hundred and twenty. On the 2d of December, as a forlorn hope, I amputated the foot at the ankle-joint. As the malleolus internus was fractured, and the articulating surfaces of the tibia and fibula divested of cartilage, I sawed off a slice of both bones. The patient improved daily after the operation, and though recovery was delayed by the unhealthy state of the leg, in which diffused suppuration repeatedly took place, the stump had cicatrized completely on the 15th of January. All who witnessed this case were persuaded that amputation of the leg would have proved fatal if performed at the time the foot was removed.

When the anterior part of the foot is destroyed by violence or exposure to cold, the remaining soft parts may be employed in different ways to afford a covering for the bones. It was for such occasions

that Chopart contrived his operation, which, from its proximity to the ankle, has hitherto been considered the last resource, short of amputating the leg. This severe measure would have been deemed necessary in the followiag case, according to the established rules of practice.

Case II.

James Sutherland, aged twenty-five, from Shetland, was admitted on the 25th of September. He stated that four months before, in consequence of exposure to cold, his left foot suffered from mortification; nearly the whole of it had separated, so that only the astragalus and os calcis, with the integuments covering them, remained. The anterior articulating surfaces of these bones were quite denuded, and it was evident that the formation of a cicatrix over them was not to be expected through any length of time or attention in treatment. But as the soft parts, though not more than sufficient for the ankle-joint amputation, seemed adequate for the purpose, I resolved to attempt the patient's relief in this way.

I performed the operation on the 3d of October, taking away no part of the integument except what was requisite to give the flaps a proper form. The wound healed by the first intention, and before the end of the fourth week the patient was able to walk through the wards with a common shoe, so that the defect of his limb could hardly be noticed.

In describing the operation, I have said that care must be taken to avoid cutting the posterior tibial artery before it divides into the plantar branches; and I may now explain more particularly the ground on which this advice is founded.

Case III.

Elizabeth Wilson, aged seven, from Dalkeith, recommended by Dr. Hunter, was admitted on the 19th of February, on account of disease in her left ankle. It had become swelled and painful about sixteen months before, without any known reason. Matter speedily formed, and was discharged spontaneously by several openings, which did not afterward heal. The foot was much enlarged, stiff, and shapeless; and two sinuses allowed a probe to pass into carious bone.

On the 21st, I proceeded to amputate at the ankle-joint, but finding that anchylosis had taken place between the articulating surfaces, I exposed the extremities of the tibia and fibula, and sawed them through, without previously removing the foot as usual. In tying the

vessels, it appeared that the posterior tibial artery had been divided before its division into the plantar branches, so that one ligature sufficed in place of two. The stump looked remarkably well, and the result of the operation was expected to prove very favorable. It was, therefore, with much surprise, and no small disappointment, that in the course of a few days I saw the flap had sloughed through fully a half of its extent. Recovery was consequently delayed much beyond the ordinary period, and the patient did not leave the hospital until the 31st of March. The stump at length cicatrized by contraction of the integuments, and though not so full and cushion-like as usual, became perfectly serviceable and comfortable.

I attributed the sloughing in this case to the undue pressure of a bandage; and having occasion soon afterward to perform the operation on a patient in Minto House, intentionally divided the posterior tibial before its division, in order to obtain the same facility in tying the vessel as on the last occasion. To my surprise and concern, the flap again sloughed to the same extent as in the case just related, and as great attention had been paid to dressing the stump, I could not refer this effect to the cause formerly supposed. But as, on both occasions, the artery had been cut before its division, while in all the other cases it had been left entire, and as the flap, being deprived of nourishment from most of its ordinary sources, must be supplied with blood only through the successive anastomoses of small vessels, I concluded that this deviation from usual practice had led to the mischief in question, and I resolved to avoid it for the future.

Case IV.

Robert Craig, aged ten, from Dunbar, recommended by Mr. Turnbull, was admitted on the 3d of June, on account of disease in his right foot. It was stated that three months before, after severe rigors, inflammation had commenced, and been speedily followed by the formation of matter. A succession of abscesses then formed, and gave rise to a number of sinuses opening in different parts of the instep and sides of the foot, and allowing a probe to enter carious bone. The general health had latterly been much impaired.

I amputated the foot on the 5th, taking care to avoid cutting the posterior tibial artery. The wound healed chiefly by the first intention, and the boy is already almost quite well.

It has now been ascertained that amputation at the ankle-joint may be performed so as to afford a stump in every respect convenient and

comfortable, retain the full use of the knee-joint, and enable the patient to walk with perfect freedom. It has also been shown that by means of this operation caries of the upper range of the tarsus, of the joint between the os calcis and astragalus, and of the ankle-joint itself, may be removed; while compound dislocation of the ankle, and destruction of the foot beyond the extent admitting of Chopart's operation, may also be remedied by it. But what other occasion besides these is there for amputating the leg? Malignant tumors of the tibia and fibula require amputation of the thigh, and compound fractures of the leg, so severe as to demand removal of the limb, hardly admit of the operation being performed below the knee, on account of the soft parts so near the seat of injury being unfit for healing action. The cases, therefore, requiring this operation, must be very few. In my own practice, since adopting amputation at the ankle-joint, I have removed only one leg below the knee, under very peculiar circumstances, which did not permit the milder measure to be adopted.

In conclusion, it may be remarked that the advantages of amputation at the ankle-joint, as compared with amputation of the leg, are not limited to the smaller degree of mutilation and greater utility of the limb; since the operation is also attended with much less danger. This will appear when it is considered: 1st. How much less the shock must be, from the small extent of parts removed, which is little more than in Chopart's partial section of the foot. 2d. That the smallness of the arteries divided prevents any risk of serious hemorrhage. 3d. That from its cancellated texture the bone exposed is not liable to exfoliate. 4th. That from the medullary canal remaining entire, inflammation of its contents, and also of the veins, is prevented.

In confirmation of these grounds for favorable expectations as to the diminution of danger, I am now able to add the proof of experience, since in fourteen cases where the operation has been performed, eight in my own practice and six in that of others, there have not occurred any fatal results.

I have endeavored to establish the general utility of amputation at the ankle, by showing the successful application of this operation to the relief of different morbid conditions, for which removal of the leg has been hitherto thought necessary. Caries of the astragalus and os calcis, and of the ankle-joint itself; destruction of the whole foot, except the heel, through exposure to cold; and compound dislocation of the astragalus, by the effects of external violence, threatening to prove fatal by continued suppuration, have all been remedied in this way. With the same view, I will now relate two cases of a different kind which have lately occurred.

Case V.

Erectile Tumor of the Foot in an Infant five months old—Amputation at the Ankle—Recovery.—I was asked by Dr. Charles Bell to see this little patient. At the time of birth there was a considerable growth of the erectile character occupying the anterior part of the foot, which did not enlarge much during the first two or three months, but afterward increased very rapidly, so as at length to destroy all trace of the ordinary form, and convert the foot into an unshapely tumor of a purple color. As the integuments of the heel remained sound, it seemed practicable to remove the disease by disarticulation at the ankle-joint. And as a very slight extension of the swelling, by preventing this measure, would have left no alternative but amputation of the leg, I advised against further delay, notwithstanding the want of any precedent for performing so serious an operation at an age so early.

On the 15th of January I removed the foot in the usual manner, with exception of not taking away the malleolar processes. The child did not suffer the slightest constitutional disturbance; and the wound healed almost entirely by the first intention. Mr. Goodsir has given me the following account of the tumor:

"A fine injection of size and vermilion having been thrown into the arteries of the foot, the skin assumed a red tint, except where it was so attenuated as to display the peculiar bluish color of the subjacent diseased mass.

"It was then cut longitudinally into two portions. A gush of venous blood reduced its size very considerably. By means of a gentle stream of water, the rest of the contained blood was washed out, all pressure being avoided.

"The two halves were then laid in a basin of spirit, and by means of a syringe, that fluid was forced into the diseased mass so as to distend the whole almost to its original size.

"After having been hardened, fresh longitudinal sections were made, avoiding all pressure, and the structure was examined.

"The venæ saphenæ, plantar and posterior tibial veins are much enlarged, and have undergone a peculiar change, which consists of increased bulk of the fibrous fasciculi of their coats, and of longitudinal and oblique foldings of the parietes, due, partly to the fasciculation, partly to actual involution.

"About the center of the foot, the veins break up into the general cellular arrangement which constitutes the disease; the saphenæ

forming a sort of central cavity on the dorsum; the plantar a much larger cavity or central areola in the sole of the foot.

"The diseased mass itself consists of areolæ, which decrease in size from the central venous cavities to the surface of the skin and to the deep limits of the disease: these limits being defined by the internal membrane of the venous system, which is continuous through all the areolæ.

"The diseased mass has not displaced the surrounding textures, but has caused them to disappear before it, as in certain malignant growths and ulcerations,—bone, ligament, muscle, and fat having equally failed in resisting its progress, the skin alone standing out against its advance, and along with the venous membrane forming the limit of its superficial portion.

"The areolæ of which the mass consists are elongated from the central cavities toward the limits of the disease, being more elongated the nearer they are to the centers. The peculiar form of the areolæ is due to the radiated direction of the bars, and imperfect laminæ which separate them, these being thicker, stronger, more elongated, and more separated from one another around the central cavities, than near the circumference, where they are shorter, finer, and much more numerous.

"The bars and imperfect laminæ consist of fibrous texture exactly resembling that of the tendinous ligaments, and aponeuroses, with numerous germinal centers.

"The bars and laminæ are all covered, and consequently the contained areolæ lined by a fine membrane consisting of tesselated epithelium, and continuous with the lining membrane of the venous system, at the central cavities, or diseased terminations of the saphenæ and plantar veins.

"In many of the bars and laminæ small arteries are situated, and one of these was traced nearly to the termination of the anterior tibial on the back of the foot. It was not ascertained how the arteries terminated, but it was presumed that they passed by small oblique orifices into the venous areolæ, as the curling arteries of the human placenta pass into the venous areolæ of the decidua."

Case VI.

Ulcer of the Heel with disease of the Os Calcis—Amputation at the Ankle—Recovery.—Thomas Niven, aged thirty-six, fourteen years ago fell into a coal-pit, and, alighting on the heel of his left foot, sustained a great shock of the whole limb. It ever afterward felt weak and impaired in sensibility, and also became thinner than the other

one. But his principal complaint was a sore on the heel, which allowed a probe to pass into the substance of the bone, and on this account he was admitted into the hospital three years after the injury, when, thinking that the limb might recover its vigor in time, if relieved from the local imperfection, I exposed the tuberosity of the os calcis, and sawed off all the part of it which seemed to be diseased. The wound healed, and he was dismissed with the prospect of being soon quite well.

He returned the 15th of August last, complaining of a sore in the old situation still exposing the bone, and also of another confined to the integument over the trochanter major, which had given him little trouble, while the former rendered him quite unable to work or make any exertion for his support. In other respects the limb remained as has been already mentioned, and excited some apprehension that even the complete removal of the local disease would not afford relief. But as the patient was extremely anxious to have anything done that promised a chance of benefit, I resolved to amputate the foot.

I performed the operation on the 19th of August, carefully preserving the integuments that remained sound on each side of the heel, so as to compensate for the great loss of substance in the sole of the foot, and thus formed two lateral flaps, which met together very well over the ends of the bones, after the malleolar processes, with a thin connecting slice of the tibia, had been sawed off. The wound healed soundly without trouble or delay; the sore near the hip also cicatrized; and the patient was dismissed on the 27th of September.

The two following cases do not present any features materially different from those which have been noticed in former communications, and may therefore be merely mentioned as confirming what has been already stated with regard to the success attending amputation at the ankle for caries,—the morbid condition most frequently requiring the operation, and for which I regret to learn that amputation of the leg is still in use. Prejudice and established habit are doubtless great obstacles to improvement, but should not be permitted to maintain what has been proved to be an unnecessary mutilation.

Case VII.

Caries of the Astragalus and Os Calcis—Amputation at the Ankle—Recovery.—Peter Anderson, aged twenty-two, from Forfarshire, was admitted on the 17th of December last, on account of a disease in his foot, which had existed for fifteen months, in consequence of falling from a height upon the heel, and for twelve months had prevented

him from following his employment as a mill-wright. I amputated the foot at the ankle on the 15th of January, and he was dismissed with an excellent stump on the 27th of March.

Case VIII.

Caries of the Tarsus and Ankle-Joint—Amputation at the Ankle —Recovery.—John Christie, aged fourteen, from Fife, was admitted on the 21st of January, on account of an extensive disease in the bones of his foot, which had existed two years. I amputated the foot at the ankle on the 5th of February; and the patient was dismissed with an excellent stump on the 30th of March.

The evidence of the above cases, and many others that speedily followed them, induced me to recommend amputation at the ankle with all the earnestness in my power, and notwithstanding the resistance of some obstacles, which even now are not entirely overcome, I have the satisfaction of knowing that this operation has long been established in the practice of surgery both at home and abroad. The obstacles to which I allude may be divided into objections, and would-be improvements. Of the former, the only one that requires notice is the risk of sloughing to which the flap is alleged to be exposed. That the flap may, and probably will still occasionally slough, is unhappily too true, but that this result is always owing to an error in the mode of performance, I think does not admit of any question. For as the integument being detached from its subjacent connections can derive nourishment only from the anastomosing vessels, it is evident that if scored crossways, instead of being separated by cutting parallel to the surface, the flap must lose its vitality. The surgeon of a large hospital told me, that having heard of amputation at the ankle, he had performed the operation repeatedly, according to the directions of a London Surgical Manual, with the invariable result of sloughing, but that then being advised by a friend to look into my own book, he had altered the procedure with constant success. This objection, therefore, has obviously no place in regard to good surgery.

The "improvements" have consisted chiefly of variations in the line of incision, so as to alter the form of the flap and render it more or less inconvenient for the purpose. It is true that the state of soft parts occasionally requires some deviation from the usual course, but when it leaves free room for choice, there can be no reasonable doubt as to the simple transverse incision originally recommended being the most convenient. The only other alteration worthy of notice is that of Professor Pirogoff, of St. Petersburg, who proposed to retain the

tuberosity of the os calcis by sawing it off before the disarticulation was completed, and thus, so far as possible, depriving the operation of all its advantages—in the first place, by rendering it complicated instead of extremely simple; secondly, by making the stump too long; thirdly, by impairing its constitution; fourthly, by retaining a portion of the osseous tissue justly liable to the suspicion of relapse; and fifthly, by not being applicable to all cases requiring amputation at the ankle. On these grounds I have been accustomed to regard the adoption of this modification as a certain sign of lax surgical principle.

In performing the operation, the foot being held at a right angle to the leg, the point of a common straight bistoury should be introduced immediately below the fibula, at the center of its malleolar projection, and then carried across the integuments of the sole in a straight line to the same level on the opposite side. The operator having next placed the fingers of his left hand upon the heel, and inserted the point of his thumb into the incision, pushes in the knife with its blade parallel to the bone and cuts close to the osseous surface, at the same time pressing the flap backward until the tuberosity is fairly turned, when, joining the two extremities of the first incision by a transverse one across the instep, he opens the joint, and carrying his knife downward on each side of the astragalus, divides the lateral ligaments, so as to complete the disarticulation. Lastly, the knife is drawn round the extremities of the tibia and fibula, so as to expose them sufficiently for being grasped in the hand and removed by the saw. After the vessels have been tied, and before the edges of the wound are stitched together, an opening should be made through the posterior part of the flap, where it is thinnest, to afford a dependent drain for the matter, as there must always be sufficient blood retained in the cavity to prevent union by the first intention. The dressings should be of the lightest description.

The advantages of this operation are, in the first place, its facility and simplicity, requiring no tourniquet, and being completed, so far as the disarticulation is concerned, without any hurry, in less than a minute; secondly, its not implicating any large blood-vessels or nerves so as to expose the patient to the risk of suffering from hemorrhage or nervous pains; thirdly, its protection against the chance of exfoliation by the spongy nature of the bone divided; and fourthly, its affording a stump so perfect as to give the requisite support without any extraneous assistance. No other stump of the lower extremity can bear pressure on its face sufficiently for supporting the body but the one in question, or at least be so used without inconvenience; and

there was a man lately at the hospital, who, after having both of his feet amputated, could not only stand, but walk and run without aid of any kind whatever.

Case IX.

P. C., aged thirty-three, was admitted into the hospital on the 25th of July, 1860, in the following state: He had been treated in the Manchester Infirmary for popliteal aneurism by pressure so decidedly applied that it had caused an ulcer, of which the cicatrix remained, but without producing the effect desired. The femoral artery was then tied, with success in so far as the aneurism was concerned, but with the unpleasant sequel, some months afterward, of mortification in the foot, which was thrown off, with exception of the astragalus and os calcis, with their integuments—a large raw surface being presented in front where the bone was bare. Although the patient was extremely weak, and the parts concerned might be supposed more than usually disposed to slough, I did not hesitate to perform the operation, with the speedy result of a most excellent stump, and complete restoration of health.

Case X.

E. M., aged seven, was admitted on the 28th of November last, laboring under a very large tumor of the os calcis. In this case, which would have rather perplexed the imitators of M. Pirogoff, I performed amputation at the ankle with perfect success in the ordinary way.

IX.

EXCISION OF THE ELBOW-JOINT.

Of all the articulations in the body, there are only two which admit of being cut out with advantage for the removal of carious bone. These are the shoulder and elbow joints. The occipital and vertebral articulations, for obvious reasons, are quite inaccessible. The hip-joint, when the seat of caries, is almost always chiefly affected on the acetabular side. The knee-joint may be excised, but not with the effect of preserving a limb so useful as an artificial substitute after amputation of the thigh. I tried the operation, nearly twenty years ago, on a boy, who recovered perfectly from it, and seemed at first to possess a limb little inferior to its fellow, except in so far as it was stiff

at the knee. But, in the course of time, it was found that the growth of the two limbs was not equal, and that the one which had been the subject of operation gradually diminished in respective length, until it wanted several inches of reaching the ground when the patient stood erect. The ankle-joint, according to M. Moreau's experience, may be cut out, but requires a very long and tedious process for recovery, which, when completed, does not afford a support for the body nearly so efficient and convenient as amputation at the ankle has been lately found to do. The wrist-joint, from its complex carpal articulations, with the numerous tendons, nerves, and blood-vessels passing over it, could hardly admit of caries being extirpated from it by excision, and certainly not so as to preserve a hand of the smallest use. The only remaining joints are those which have been mentioned as proper subjects for the operation; and I have already stated the grounds for believing that amputation at the shoulder is almost always preferable to excision of this joint, so that the field for excision would seem nearly limited to the elbow.

In this situation everything is favorable to the operation. The bones are thinly covered behind, so as to be easily accessible on that side. Their cancellated texture, to which the carious disease is limited, has a small and well-defined extent. The muscles of most importance, together with the nerves and blood-vessels, need not suffer any injury; and the limb preserved is infinitely more useful than any substitute which art can fabricate or wealth procure.

In the year 1826, soon after operating with success upon a shoulder-joint, I had placed under my care a young gentleman laboring under disease of the elbow, which, after a prolonged and careful treatment, so affected his general health as to show the necessity of some decided measure of relief. I proposed excision of the joint; but not being able to obtain the sanction of any senior practitioner for an operation which had not been performed in Great Britain, I was compelled to choose the only alternative, and amputate the arm. Soon afterward another case occurred, in which, as the disease seemed limited to the olecranon, I tried the effect of removing this part of the joint, but with such imperfect success, that it subsequently became necessary to excise the remaining part of the articulation. Being thus encouraged to undertake the operation, I published in the *Edinburgh Medical Journal* of April, 1829, "Three Cases in which the Elbow-Joint was successfully excised;" and in 1831, a "Treatise on the Excision of Diseased Joints," in which fourteen cases of operations on the elbow-joint are recorded. Since that time I have regularly practiced this operation in all cases that appeared suited for its per-

formance, and have now employed it on at least sixty or seventy occasions, with results which have induced many members of the profession to adopt this procedure, and removed the scruples of its most determined opponents.

In order to perform the operation with success, it is necessary to pursue a proper plan, grounded upon correct principles. Before describing the mode of operating which I have found most convenient, it may be of use to explain the views which led me to its adoption; and for this purpose the following extract from my original paper of 1829 will probably be most satisfactory.

Though few surgeons now make the mistake, so frequently committed not many years ago, of confounding caries with necrosis, the former of these diseases still remains in much obscurity and uncertainty, whether we regard its pathology or treatment. It is not my intention at present to write a treatise on this subject, but merely to notice some particulars concerning it which seem deserving of attention from practitioners.

Caries is generally seated in bones possessing a cellular or open texture, and when it occurs in those of the tabular or cylindrical kind, it is uniformly preceded by a morbid expansion of the compact structure into a state resembling that which naturally belongs to those where the disease usually resides. Everybody knows that the shafts of bones, and especially the tibia, in consequence of chronic inflammation, are frequently enlarged, thickened, and at the same time loosened in their texture, which comes to have nearly the same appearance as that of the spongy articulating extremities. In bones so altered caries occasionally occurs, or I should rather say a condition resembling caries, since it differs from this disease in one important feature, viz., *incorrigibleness*. I have hardly ever known this spurious caries resist the local application of blisters, and internal use of oxymuriate of mercury;* and I have felt very uncomfortable in seeing extensive incisions, rasping, trephining, and glowing choffers bristling with actual cauteries, employed ineffectually to cure complaints admitting of such easy remedy.

True caries then may be said, without any exception, to occur always in spongy or cellular bone, and the appearance of the diseased portion is extremely uniform. Surgeons formerly described many different kinds of caries, the dry and the moist, the worm-eaten and the fleshy, etc.; but this variety of description depended on a confusion of

* Corrosive sublimate was considered the best antidote for the other preparations of mercury, before the use of iodine was introduced for this purpose.

caries with other morbid states of the osseous tissue, which ought to have been, as they are now, very carefully distinguished. The carious bone, after maceration, looks as if it had been burnt, being harder, whiter, and more brittle than usual, and there being always more or less excavation so as to expose the cellular structure, it greatly resembles a piece of loaf-sugar which has been partially dissolved by momentary immersion in hot water.

It is of much importance to recollect that caries seldom affects the bone to much depth. Thus we often see an articulating extremity carious over its surface and sound in the center. At other times we find it hollowed out into a cavity, the inner surface of which is carious while the external shell is sound. The very limited extent of the disease often contrasts remarkably with the extreme obstinacy and severity of its symptoms. Thus, there is in my possession a thigh-bone which I took from the body of a woman who had labored under caries of the trochanter major for thirteen years, yet the whole disease may be covered by the point of a finger, and is not thicker than a sixpence.

Among the characters of caries, we find mentioned a fetid discolored discharge; but any surgeon who trusted to such an indication would be greatly deceived, since, as far as I have seen, the matter can seldom be distinguished from that which does not proceed from bone, or what is usually called healthy pus.

Caries cannot, like necrosis, be induced directly by the effect of violence. It depends on a peculiar morbid action, which is probably in all cases preceded by inflammation. Many people think that pressure may induce the disease, but they do so erroneously. It is true that pressure, such as that of an aneurism, causes absorption of bone, and gives rise to an appearance which might be mistaken for caries by an inexperienced or careless observer, but could never for a moment impose upon any one acquainted with the distinctive characters of the disease. The surface exposed by simple absorption differs in no respect from that which would have appeared if the excavation had been effected by violence. We do not here perceive the hardness, whiteness, and brittleness of caries, neither is there any matter secreted from it; and so soon as the cause is removed, the disease ceases. The effect of pressure in causing absorption without inducing caries is well seen in those cases of necrosis where internal exfoliation occurs, and the confined pus makes a way for its escape through the cylindrical walls of the bone, since the sides of these passages so produced by absorption, through the effect of pressure, are in no respect carious, or unfit for healthy action. Deep-seated collections

of matter ought to be evacuated early to relieve the patient from pain, or prevent extension of the fluid, but no apprehension need be entertained of caries being produced by its pressure.

Inflammation, as already stated, most generally, if not always, precedes this morbid condition; but it is worthy of recollection that inflammation and even suppuration of bone are not necessarily followed by caries. In cases of compound fracture, amputation, excision of joints, etc., we every day see bones suppurate and granulate in the most satisfactory manner. We observe the same thing occasionally in joints which become anchylosed after being the seat of abscess. There can be no doubt, however, that suppuration of bone, which either takes place spontaneously, or in consequence of slight external injury, is very frequently followed by caries, much more so than when it results from a wound which does not heal by the first intention; the reason of which difference probably is, that bone does not readily either inflame or suppurate, but from violence, except in bad constitutions little able to carry on the process requisite for accomplishing a cure.

Generally speaking, caries occurs in persons of a habit naturally weak or unhealthy, or rendered so by improper modes of life, the suppression of some accustomed secretion, or any other circumstance destructive of the balance of action in the system. Much perplexity has arisen from enumerating among the causes of caries, scurvy, gout, rheumatism, etc. If, instead of this, it had been said that caries is apt to happen in those disordered states of the constitution which give rise to the symptoms of scurvy, gout, or rheumatism, there would have been no difficulty in understanding the operations of these alleged causes.

The treatment of caries is preventive and remedial. The means of prevention are all those which tend to remove the constitutional defects that lead to the production of the disease, together with the use of those agents which counteract deep-seated inflammation, such as the various counter-irritants, from the actual cautery downward. The actual cautery, though occasionally employed to destroy morbid structures and suppress hemorrhage, has not hitherto, so far as I know, been used in this country to effect counter-irritation. I have used it extensively on the authority of Rust, who, in his treatise on "Arthrokakologie oder Verrenkungen durch innere Bedingung," affirms the most decided facts in its favor, and I hope that so powerful a remedy will soon come into general use.

Though various external applications were formerly thought capable of altering the morbid action of carious bone, and so effecting a cure, I believe all well-informed practitioners now regard the disease

as truly incorrigible, and remediable only by destruction of the part concerned. The question, therefore, comes to be, how can this be best accomplished? The means employed are caustics, cauteries, and excision. The first are little used, owing to their inefficiency. The actual cautery is a more powerful remedy, and has many friends, but may, I think, be objected to on the grounds,—first, that in most cases it can hardly be applied to all the affected surface; secondly, that the extent of its operations is very limited.

Suppose we have to treat a carious joint, where the whole respective surfaces of articulation are diseased, how can the red-hot iron be applied over the whole? and unless it is applied over the whole, how can the disease be cured, since the cautery extends its effect to a very inconsiderable distance? But some may deny this last statement, and certainly with the appearance of reason; since any one would suppose, unless taught by experience to the contrary, that the glowing iron must affect the bone to which it is applied, far and wide, from the part immediately concerned. About ten years ago I saw a surgeon remove an eye, together with a large tumor, from the orbit of a boy aged fourteen, and then apply a succession of full-sized cauteries to the thin orbitary plate of the frontal bone. I expected that, if the patient did not die from inflammation of the brain or its membranes, the whole thickness of the roof of the orbit must exfoliate. But neither of these events took place; and it was found on dissection, some weeks subsequently, that the bone had been affected to a very slight depth. Having my attention called to the subject by this circumstance, I took every opportunity of observation, and ultimately satisfied myself that the actual cautery affects a mere film of the bone to which it is applied.

The only other mode of destroying carious bone is excision, which I am convinced is by far the best, since more can be done by the gouge or cutting-pliers in a few seconds, than by the actual cautery in as many weeks or months. In performing the operation, the surgeon ought to expose the bone very freely, and pursue his excision until he feels that he is cutting in sound bone. It is usual to apply the actual cautery after the diseased bone has been cut away; but this proceeding seems very objectionable. If any carious bone remains, the cautery, for reasons already mentioned, will hardly be able to destroy it, at least another scrape with the gouge would be ten times more effectual and if it is all taken away, as it may and ought to be, what can be more preposterous than irritating anew a weak bone, thereby exposing it to the danger of a relapse?

When the large joints are carious, it is much better to remove the

articulating extremities, entire, instead of attempting to cut away the diseased surface piecemeal, which in most cases, indeed, would be impossible.

In performing the excision of joints, it ought to be remembered that caries does not affect the bone deeply; and, therefore, that while the surgeon ought most carefully to avoid leaving any of the diseased *surface*, he should give himself little concern as to the thickness of bone which he removes. I think it the more necessary to make this observation, from seeing that Mr. Crampton cut away four inches of the humerus, which I should certainly conceive was equally unnecessary and injurious. There is always much effusion of new bone for some distance, generally several inches round the carious portion, and the alteration of appearance thus induced is, I know, frequently mistaken for a morbid one. It is no more morbid than the callus which unites a fracture, and ought, therefore, to be carefully distinguished. As already stated, the surface presented by caries is excavated, rough, and spicular, such as would result from burning a cellular bone and then laying open its internal structure. The surface of effused bone, on the contrary, is compact and warty; it looks as if the ossific matter had exuded in a fluid state and congealed into drops; so that, while the carious part resembles a piece of sugar partially *dissolved* by water, the surrounding effusion of new bone has the appearance of sugar partially *melted* by heat.

The excision of joints is usually regarded as a formidable operation, difficult, painful, and dangerous; and, as I observed in relating a case where the shoulder-joint was excised, it is not difficult to discover the source of this apprehension. The slightest wounds of healthy joints are known to be frequently productive of the greatest mischief, and hence the proposal to cut them out altogether seems equally rash and frightful. But it ought to be recollected, in the first place, that all the structures which excite so much disturbance by their inflammation, are removed when the joint is excised; and, secondly, that in cases requiring excision the natural structure does not exist, being destroyed by the previous disease. Carious joints, therefore, may be cut into with the same impunity as ordinary abscesses, and cut out with no more danger than what attends amputation, or rather not so much, since the balance of action will be less disturbed, *cæteris paribus*, when the limb is allowed to remain. As to the additional trouble and pain which may attend excision, they ought surely not to be reckoned of much importance in consideration of saving a limb.

From this statement it will appear that the great fundamental principle of the operation is, that the obstacle to recovery from the disease

lies entirely in the bone, and not in the soft parts, however much they may be altered by suppuration, thickening, or ulceration. Next in importance, is the discrimination between the carious part of the bone, and the effusion of osseous substance in its neighborhood. In the bones represented (see p. 649) the whole extent requiring removal is comprehended between the lines A A and B B. From not attending to this circumstance, M. Moreau of Bar-sur-Ornain, who first performed the operation, removed the end of the humerus as high as he felt it rough; and Sir Philip Crampton took away no less than four inches of this bone. It is no wonder that the patient of the latter gentleman, at the end of seven months, could only "give a slight degree of flexion to the fore-arm,"* or that such a case should have afforded little encouragement to repeat the operation.

When the operation is to be performed, the patient should be laid on his side, or with his face downward; so that the posterior surface of the joint may be presented in a convenient position. The incisions of Moreau have always seemed to me the best adapted for gaining free access to the joint, with least injury of the soft parts. They present the form of the letter H. The transverse incision should be made first, by pushing the knife, a straight bistoury, with its blade toward the ulnar nerve, into the joint, and cutting close to the olecranon, across to the external tuberosity of the humerus. The longitudinal incisions having next been made, the square flaps thus formed are to be reflected upward and downward. The olecranon is now so exposed that it may readily be removed by a stroke of the cutting-pliers, and thus render the subsequent part of the operation much more easy. The external lateral ligament of the joint being then divided, it becomes easy to press aside the ulnar nerve over the internal tuberosity of the humerus, and divide the internal lateral ligament, after which the extremity of the bone may be grasped in the hand, and divided in a line with the tuberosities by a common amputation saw. The head of the radius then lies quite exposed, so that the cutting-pliers, being applied to its neck, at once detaches the head, which alone participates in the disease; and nothing remains but to separate the soft parts, including some of the fibers of the brachiæus internus, so as to insulate what is left of the sigmoid cavity, and allow the saw to remove it in a line with the surface of the decapitated radius. It might seem an easier and simpler process to remove the whole articulating extremity of the ulna at once; but this would not be found so in practice, since the attachment of the brachiæus internus to the coronoid process can hardly be divided so long as the bone remains entire. There is sel-

* Dublin Hospital Reports, vol. iv.

dom much bleeding, but if any vessels jet they should be tied, to prevent the risk of mischief from distention of the wound. The cut edges should be carefully stitched together by the interrupted suture, and have some dry lint placed over them. And lastly, the limb being held semi-bent, a roller about six yards in length is to be applied in the figure of 8, to give the requisite support, which it does far more effectually than any sort of rigid case.

If the bones have been removed to a proper extent, so as to extirpate the disease without too much impairing the support of the arm, the process of recovery is quickly accomplished, with hardly any defect in the mobility or strength of the limb. Anchylosis or osseous union never takes place, though at one time alleged to afford the only chance of rendering the hand in any degree useful. The medium of union is always of a tough fibrous consistence, similar to that of the ligamentous texture. This might be inferred from the firmness and moderate degree of mobility, which can hardly be distinguished from that naturally belonging to the joint; and I have ascertained such to be the state of the joint by dissection. The following cases may be taken as examples of the operation, and its results:

Case I.

John Currie, aged eighteen, was admitted into the Royal Infirmary on the 13th of June last (1844), on account of disease in his left elbow-joint. He stated that, without any assignable cause or perceptible pain, a swelling had commenced about four years before, and that three weeks after noticing it, he had applied to a bone-setter, who treated him very roughly in attempting to reduce a bone which he alleged was dislocated. Though the swelling increased and became very painful in consequence of this treatment, he submitted to its repetition twice a week for three months; the joint upon each occasion being subjected to the most violent twisting and bending. At last, finding his complaint getting worse and worse, he applied to another bone-setter, who assured him that the bone had not been out of its place, and that he was the victim of mismanagement. Nothing was then done, and no change worthy of notice occurred, until nine months before the time of admission, when a discharge of matter took place spontaneously from the joint. The elbow was much enlarged, and had entirely lost all trace of its proper form; there were several openings from which thin matter issued copiously, and through which a probe could be passed down to carious bone; the patient was much emaciated, and had a very suspicious cough. But as the most careful

stethoscopic examination did not detect any evidence of pulmonary disease, it was hoped that relief from the local complaint might restore general health.

On the 28th, I performed the operation in the usual way. The articulating surfaces of all the bones were divested of cartilage and carious. They were exposed in succession, and removed by the saw, which I find preferable to the cutting-pliers for this purpose. No bad symptom followed the operation; the wound healed satisfactorily, and the patient very soon began to regain his health; the cough ceased, and the other indications of a phthisical tendency disappeared. He was dismissed on the 14th of August, able to resume his occupation as a "skinner." I saw him lately, and could not have distinguished the imperfect arm, unless my attention had been directed to it.

Case II.

Christian Hunter, aged fifty-three, from Kelso, recommended by Dr. F. Douglas, was admitted on the 10th of November, 1843. She stated that for ten years she had complained occasionally of pain in the right elbow, stretching down to the wrist and hand, and gradually becoming more severe as well as frequent. Nine months before the time of her admission, the joint swelled to a great size, and the pain, which was then incessant, suffered so much aggravation by the slightest movement, that she was obliged to keep the limb entirely at rest. An opening was made soon afterward, with the effect of discharging a large quantity of matter and affording relief from the pain. The disease then remained stationary.

On examination, the elbow was found considerably swelled, and scarcely movable. It could not be extended beyond a right angle, or bent, except very slightly; and the arm was almost powerless. A sinus on the outer side of the joint allowed a probe to enter the articulation. I performed the operation on the 15th of November, cutting out the articulating extremities of all the bones, which were completely carious. The soft parts being unusually sound, healed quickly; indeed, almost entirely by the first intention, so that the patient was dismissed quite well on the 18th of December. I heard soon afterward from Dr. Douglas, that on calling to see how she was doing, he had found her knitting her stockings, in good health, and free from any uneasiness.

Case III.

In November, 1844, I was asked to see a lady with Dr. Thatcher and Dr. John Brown, on account of disease in the right elbow-joint.

She was about forty years of age, very thin and exhausted-looking, with every appearance of speedy sinking after protracted illness. It appeared that she had been suffering severely, for more than two years, from ulceration of the articular cartilages, which had terminated in suppuration and caries. There were sinuses of eighteen months' standing, through which a probe could be passed in different directions into the cancellated texture, and the bones composing the joint admitted freely of lateral movement. It was obvious that the patient could not much longer endure the constant drain upon her strength; but any operation was thought quite out of the question in her weak condition, which indeed seemed so extreme as to render unsafe even any allusion to such a proceeding.

About a month afterward I again saw this lady, and then, with the sanction of her other medical friends, ventured to propose removal of the diseased bone. She consented to the operation, which was performed as usual, so as to excise the whole articulating extremities of all the bones composing the joint. She bore it well, and, before the end of another month, was able to employ the hand of the arm affected for knitting. She has since enjoyed perfectly good health, and had an addition to her family.

Case IV.

James Tainsh, aged eight, from Stirling, was admitted on the 26th of May, 1836. He had hurt his elbow by falling on it in the month of December before, since which time the motion of the joint had become gradually impaired, abscesses had formed, and large ulcers opened leading down to the bone. I cut out the joint on the 31st in the usual way. The patient suffered so little disturbance from the operation that he could be with difficulty confined to bed; and in two or three days was going about as if nothing had happened. He went home on the 25th of June.

Case V.

Boaz Simpson, aged thirteen, was admitted on the 29th of May, 1833, on account of a diseased elbow-joint. It was very much enlarged, stiff, and discolored. Various sinuses, opening at different parts of the limb, led down to the bones. The arm both above and below the elbow was extremely emaciated. The patient was of very small growth, and had a short dry cough; but took his food well, and was in other respects healthy. It was stated that the disease had commenced between three and four years before, with the formation of

an abscess, independently, so far as could be learned, of any external violence, and had advanced progressively notwithstanding every attention.

It was evident that recourse must be had either to excision or amputation, and though the patient certainly did not seem a favorable subject for either, or indeed for any operation, the former did not appear to be attended with more danger than the latter, while the preservation of the limb was evidently a most important object.

The operation was performed on the 7th of June in the usual way. The whole of the articulating surfaces were removed. The patient suffered hardly any constitutional disturbance, and on the third day was allowed to sit up. The discharge in a few days almost ceased; and in the course of a fortnight he could use the arm a little. He was detained in the hospital until the 5th of August, in order that his progress to complete recovery might be observed; but he might have been dismissed much sooner, as for several weeks there had been merely a few drops of serous discharge daily.

Case VI.

James Topings, aged seventeen, Shotts, admitted August 17th, 1833. The elbow was enlarged, and admitted of very little motion. A sinus over the internal tuberosity of the humerus allowed a probe to reach the bone and enter into the joint. The disease had existed upwards of twelve months, and was becoming progressively aggravated. The articulation was excised in the usual manner on the 1st of September. No bad consequences followed; and the patient was dismissed on the 22d October. He returned some weeks afterward to show how well he was, there being no discharge from the wound, and the arm being not only movable, but already under the voluntary command of the muscles.

It would be useless at present to expatiate upon the advantages of cutting out the elbow-joint over amputation of the arm. During a long period I advocated the former operation with hardly any support, and combated all the objections brought against it, which not unfrequently assumed the acrimony of personal feeling. But for many years this procedure has been established as the rule of practice, and the only room now left for discussion on the subject is limited to the mode of performance, the degree of motion attainable, and the nature of the uniting medium that supplies the place of the articulation.

An account of fourteen cases in which I had performed the opera-

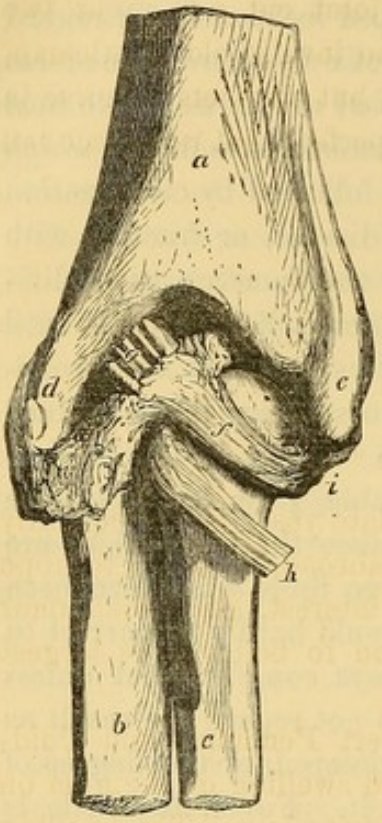
tion was published in the year 1831 (see pp. 671–691); and since then, having annually repeated it from four or five to eight or ten times, I have had ample opportunity of making myself fully acquainted with the points just mentioned. The H-shaped incision I still regard as most convenient for the purpose, since it not only affords free access to the joint, but also allows the transverse part of the wound to heal by the first intention, and thus prevent the obstacle to mobility, which would result from the process of granulation followed by cicatrization at this part. In cases of anchylosis, from disease, or fracture with displacement of the articulating extremity of the humerus, great difficulty was experienced in removing the mass of consolidated bone, until I adopted the plan of sawing it through transversely at the prominence of the ulna, and then exposing the two surfaces thus obtained so as to allow the requisite extent of division.

In regard to the degree of mobility attainable, I am led to believe that there exists a great misapprehension, since the cases which are seen here generally occasion much surprise to those who have been accustomed to the practice elsewhere. It would hardly be correct to say that both flexion and extension are always complete, but unless these conditions are obtained, we certainly do not regard the result as successful. The extent of bone removed determines the degree of mobility, and also the power of controlling it. For if too little is taken away, there will be more or less complete anchylosis; and if too much, such a relaxation of the muscles as must prevent their efficient action. In order to eradicate all the diseased or carious portions of the bones, it would very seldom be necessary to remove more than the articulating surfaces. But if limited to this extent, the operation would prove a failure in respect to mobility; while, on the other hand, if the humerus were shortened three or four inches, as in the solitary case of Sir P. Crampton, a very long time would be required for the muscles regaining their motive power. As a general rule, I should say that the section ought to be about the commencement of the condyloid projections of the humerus, and at the base of the coronoid process of the ulna.

As to the uniting medium, it might be expected, from analogy with what happens in fractures when there is no osseous union, that the medium of connection between the bones would be of a ligamentous nature, not imitating a joint, but simply binding the two surfaces together; and such, accordingly, is the condition that has been found in the cases which have come under observation. Of these the most remarkable is represented in Fig. 21. It was taken from a man who, after suffering excision of the right elbow-joint in the hospital here,

during nine years acted as a guard on the Edinburgh and Glasgow Railroad, swinging himself off and on the carriages, and discharging all the active duties of that most energetic employment, to the entire satisfaction of his employers. It will be seen that there are several ligaments extending between the bones, and that at their points of attachment there has been a remarkable production of new osseous substance, so as in some measure to supply the place and represent the form of the portions removed.

Fig. 21.



In illustration of what has been said, it would be useless to relate any recent cases, since a considerable length of time is required before the result can be fully ascertained. But it may be of service to notice the condition of some former patients who happened to present themselves during the current course, in grateful expression of the benefit they had derived from the operation.

Case VII.

J. G., aged twenty-three, called at the hospital on the 13th of May last, to show himself. He stated that twelve years ago I had cut out his right elbow-joint for disease of the bone. For some years of late he had been the principal steward of a large Atlantic steamboat, and there discharged his multifarious duties so perfectly, that during a voyage to the West Indies and back again his captain had not discovered the arm to be in any respect different from a sound one, which indeed it was not, with regard to the most complete flexibility, extensibility, rotation, and strength, though of course somewhat shortened.

Case VIII.

W. R., aged fourteen, called at the hospital on the 7th of May last, to show his right arm, of which I had cut out the elbow-joint about a year before, on account of anchylosis, following an injury. The limb was perfectly sound and strong, admitting of every movement, as if nothing had been done to it.

Case IX.

E. M., aged twenty-two, had her elbow-joint cut out about two years ago. She is now the sole servant of an invalid old gentleman, and not only does all the work of his house, but also acts as nurse in very difficult circumstances. The arm is so perfect that no defect can be detected in it.

X.

EXCISION OF THE LOWER JAW.*

Though excision of the lower jaw has of late years been frequently performed by various surgeons at home and abroad, I venture to hope that the following case will be read with interest, since the tumor which was the subject of it is, I have reason to believe, the largest that has been removed by this operation.

Between eight and nine years ago, Robert Penman, from Coldstream, then sixteen years old, noticed a hard swelling of the gum on the outer side of the grinding teeth of the lower jaw. The swelling was not painful, but gradually increased. When it attained the size of an egg he applied to a surgeon of the neighborhood, who extracted three of the adjoining teeth. It then grew more rapidly, and having at length become so large as an orange, induced him to repair to the Royal Infirmary of this city, where it was removed, *i.e.* cut off from the bone. The wound did not heal, and the actual cautery was repeatedly applied in vain to make it do so. After remaining eight months in the Infirmary, he returned home; but finding the tumor regularly and rapidly increasing, he, two years afterward, came again to Edinburgh, and consulted a distinguished operating surgeon (now in London), who declined making any attempt toward his relief. He went home with the fearful prospect of a certain, lingering, and painful dissolution; and it was after *three years and a half* spent in this miserable state that Dr. Sibbald of this city happened to see him. Though the tumor was then nearly three times larger than it was when the patient last quitted Edinburgh, Dr. Sibbald felt persuaded that it was still within the reach of surgery, and therefore encouraged the young man to come once more to town, which he accordingly did.

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* From the Edinburgh Medical and Surgical Journal, No. 97, 1828.

Though prepared for something very extraordinary and frightful, I certainly was astonished at first sight of the patient. (Fig. 22.)

This representation may give some notion of what mere words are altogether inadequate to express.

Fig. 22.

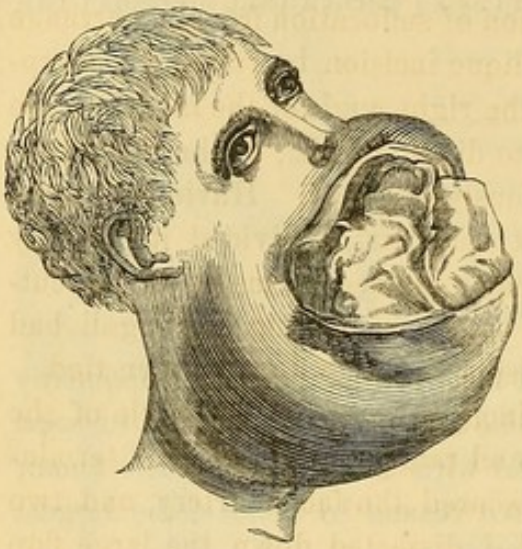
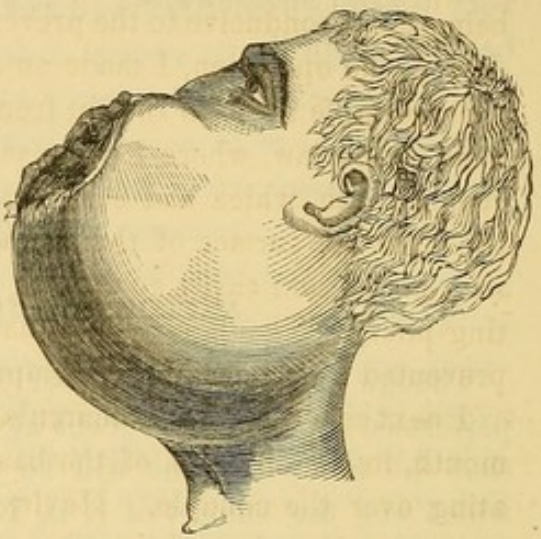


Fig. 23.



The mouth was placed diagonally across the face, and had suffered such a monstrous distention as to measure fifteen inches in circumference. The throat of the patient was almost obliterated in appearance, there being only about two inches of it visible above the sternum, so that the cricoid cartilage of the larynx was on a level with that bone. When the tumor was viewed in profile it extended eight inches from the front of the neck. (Fig. 23.)

It completely filled the mouth, and occupied all the space below it, from jaw to jaw. The tongue was thrust out of its place, and lay between the teeth and cheek of the right side. The only portion of the jaw not implicated in the disease was the right ramus and base of the same side, from the bicuspid teeth backward. The tumor, where covered by the integuments, was uniformly very firm, and for the most part distinctly osseous. The part which appeared through the mouth was a florid, irregular, fungous-looking mass of firm consistence, from which an alarming hemorrhage had occasionally occurred; and for the last three or four weeks there had been almost daily a discharge of blood to the extent of one or two ounces. Notwithstanding the great bulk of the tumor, the patient could move his jaw pretty freely in all directions. With the exception of the disease now described, Penman enjoyed good health. He was a tall, well-made, though much emaciated, intelligent young man, and possessed uncommon fortitude.

Having carefully examined the tumor, I undertook to remove it; and this proposal meeting with the approbation of Dr. Abercrombie and Professor Ballingall, was, with the assistance of the latter gentleman, carried into execution on the 7th of July, in the presence of Dr. Abercrombie, Professor Russell, Dr. Hunter, etc.

The patient being seated on a chair, which posture I preferred, as being most conducive to the prevention of suffocation from hemorrhage during the operation, I made an oblique incision by running a sharp-pointed knife through the lip from the right angle of the mouth to the base of the jaw, where I proposed to divide it, viz., at the second bicuspid tooth, which had been previously removed. Having exposed the external surface of the bone at this part, I divided it partially with a saw, and easily completed what remained by means of the cutting-pliers. The inferior coronary artery, which Dr. Ballingall had prevented from bleeding by compressing it in the lip, was then tied.

I next made a long semicircular incision from the left angle of the mouth, in the direction of the base and ramus of the jaw, and terminating over the condyle. Having secured the facial artery, and two transverse branches of the temporal, I dissected down the large flap thus formed quite to the neck, so as to let Dr. Ballingall feel the carotid lying in the muscular interspace, and ready to be compressed if there should be occasion. I then made another curved incision in a similar direction, commencing from the mouth, at such distance above the former as to include a portion of the cheek, which was firmly adherent to the tumor; and, having dissected up this flap, divided the masseter muscle, so as to expose the whole external surface of the tumor. The next step was to divide the mucous membrane of the mouth. This rendered the tumor much more movable, and enabled me to expose the coronoid process, divide the temporal muscle, and open the articulation at its fore part. I had then merely to cut closely round the condyle, and detach the pterygoid, mylohyoid, and other muscular connections.

The operation occupied twenty-four minutes; but all this time was not employed in cutting, as I frequently allowed a little respite, to prevent exhaustion from continued suffering. The patient bore it well, and did not lose more than seven or eight ounces of blood. His breathing was never in the slightest degree affected.

After placing a few folds of lint in the great cavity left by the tumor, which weighed 4½ lbs., I brought the integuments together on the left side of the face, in a triangular form, and retained the edges in contact by the twisted suture. The incision on the right side was dressed in the same way. Two or three turns of the roller were then

put round the chin and head, so as to support the relaxed integuments.

The patient made no complaint of any sort after the operation. His pulse for the first two days was about one hundred, but soft, and gradually subsided to the natural standard. He slept well; had an appetite for his food, viz., beef-tea and whey, which were introduced into the pharynx through a funnel with curved tube; and performed his excretions regularly. The whole of the lint was removed by the third day, when the patient sat up, and declared that he felt better than he did previous to the operation.

In concluding this case, I may offer a few general remarks on the mode of operating.

The patient ought certainly to be seated, since the blood will thus be prevented from running into his throat so as to delay the operation, or even render tracheotomy necessary to prevent suffocation.

There is no advantage in tying the carotid artery previous to commencing the extirpation. I was advised to do so in this case, but declined on the following grounds: 1. It is unnecessary, since the only arteries which must and ought to be cut are the facial, some of its branches, and some branches of the temporal. 2. It must exhaust the patient, especially when the tumor throws an obstacle in the way, as in Penman's case, where there was hardly any space left for applying a ligature. Thus, in one of Dr. Mott's cases, the patient was so much fatigued as to require the delay of a day after the artery was tied. 3. It increases the danger, since it cannot be denied that there is always more or less risk of hemorrhage on the separation of a ligature from so large a vessel as the carotid. 4. It is of no use, since the anastomotic communications are so free that a ligature of the trunk is not sufficient to arrest the flow of blood from its branches. Thus, in Dr. Mott's case above mentioned, the arteries which were cut during the operation required to be tied; and I have heard of a case where the operator, attempting to remove a tumor of the upper jaw, tied *both* carotids, and was still obliged to desist by the bleeding. 5. Any good effect that can be expected from *tying* the trunk, may be obtained by *compressing* it after the integuments lying over it have been dissected off or divided.

The external surface of the tumor should be completely exposed before proceeding further, since all the vessels which ought to be tied may then be secured in the first instance, and a free drain is afforded to the blood which oozes from the small branches. The mucous membrane of the mouth being next cut, the tumor is rendered much more movable, and the surgeon will generally be able to free the coro-

noid process from its muscular connections. Should he fail in doing so, he ought to cut it across with the saw or pliers, and then, depressing the tumor as far as possible, open the articulation on its fore part; after which he has merely to carry his knife close to the tumor, and divide the remaining attachments.

I think Dr. Cusack is entitled to much praise for insisting on the propriety of opening the articulation from before, since a wound of the internal maxillary, or even the temporal, is otherwise almost inevitable. Thus Mr. Liston, in the case detailed in the last number of this Journal, opened the joint from behind, and found it necessary to tie the common trunk of the temporal and internal maxillary,—in short, the external carotid. And I think that the patient in this case would hardly have suffered the severe secondary hemorrhage which is mentioned in the relation referred to, if the superficial vessels merely had been divided.

It appears, also, that in Mr. Liston's case the ascending branches of the portio dura were cut, since the patient's eyelids were paralyzed. Now, this in all probability would not have happened if the articulation had been opened from before.

About two years ago, and consequently seventeen years after this operation, I was stopped in the street by a well-dressed, respectable-looking man, who introduced himself as "Penman." He told me that, after working for several years at home as a bootmaker, he had gone in quest of better wages to New York; that he had spent ten years in America, whence he had just arrived; and that he proposed to return there after a short visit to his native country. I was no less surprised than pleased to see how little the operation had injured either his appearance or articulation. Careful inspection, indeed, was requisite to enable an ordinary observer to detect anything peculiar in either of these respects.

Since the date of Penman's case, I have operated many times, in a great variety of circumstances, for the removal of tumors originating in the lower jaw, nearly always with the effect of affording permanent relief to the patient. Of the very few cases that terminated unfavorably, two were those, in one of which the operation was most extensive, and in the other most limited. In the former I disarticulated the entire jaw, expanded into an enormous growth, by making an incision from ear to ear under the chin, without cutting through the lip. The operation was performed in the Royal Infirmary on the 1st November, 1843, with little more difficulty than usually attends the removal of one *ramus*, and the patient, a female, twenty-five years of age, bore it so well that the most favorable expectations were enter-

tained of her recovery. Everything went on well until the evening of the following day, when her respiration suddenly became embarrassed, and she died before the cause of disturbance could be either discovered or remedied. I had some suspicion that displacement of the tongue was concerned in producing the effect, but could not obtain any satisfactory information upon the subject. Of the other case I have given the following account:*

DISARTICULATION OF THE RAMUS OF THE LOWER JAW, WITHOUT OPENING THE CAVITY OF THE MOUTH.

About the middle of July, in passing through Dumfries, I was asked by Dr. Blacklock to see a lady who was suffering from a tumor of the face. She was between thirty and forty years of age, and had enjoyed good health until the preceding summer (1842), when her friends remarked that she had become thinner than before; and she noticed some uneasy feeling in the left side of her face. The jaw was impeded in its movements, twinges occasionally extended from the ear to the temple, and she experienced pain from resting her head on the affected cheek. In the month of December, as these symptoms had not diminished, but rather increased, and become associated with a hard swelling in the situation of the parotid, the advice of a medical friend was requested in regard to her complaint, and the gland being naturally looked upon as the seat of it, leeches, followed by blisters, were repeatedly applied without producing any good effect. The pain, stiffness, and swelling had continued to increase with accelerating rapidity, so as at length to excite the apprehension of there being a growth from the bone.

On examination, I found that the swelling occupied the situation of that part of the parotid gland which lies over the ramus of the jaw. It presented a slight convexity or circular form, about an inch and a half in width, extending from the zygomatic arch downward, and backward to the mastoid process. The consistence was so firm, that it could not be distinguished from that of bone. The jaw could not be expanded so as to separate the edges of the teeth, and when moved to the slight degree still permitted, seemed to carry the swelling with it. On putting my finger within the cheek, I felt that the tumor encroached considerably on the cavity of the mouth, but did not extend farther forward than the wisdom tooth. From the observations which have now been stated, together with the history of the case, concluding that the tumor in no respect, except the peculiarity of its seat, differed

* Monthly Journal of Medical Science, 1843.

from those that of late years have so frequently been removed with success, by excision of the lower jaw, I advised the operation to be performed without delay; and, a few days afterward, the patient arrived in town for the purpose of undergoing it.

On the 25th of July, assisted by Mr. Goodsir, I made an incision from the zygomatic arch down along the posterior margin of the ramus, slightly curved, with its convexity toward the ear, to a little way beyond the base of the jaw. Having then dissected the parotid gland and masseter muscle off the surface of the jaw, I divided it immediately behind the wisdom tooth, by means of cutting-pliers, after notching it with a saw. As the ramus, upon this being done, did not as usual become more movable, I searched for the reason of its fixture, and found that the tumor had extended inward and backward, so as to rest upon the pterygoid and styloid processes, and completely lock the bone into its place. Having contemplated difficulty from this source, though not to the same extent, I had provided a strong pair of tooth forceps, with which the ramus was seized at its divided extremity, and forcibly drawn outward, while I divided its muscular connections, as they were successively brought within reach of the knife. In this way the tumor was detached, and turned out quite entire. It possessed the ordinary texture of fibro-cartilaginous growths proceeding from bone.

The operation was thus completed with wonderfully little disturbance of the face; there being no division of the facial artery, only partial detachment of the masseter and internal pterygoid muscles, and no wound of the mucous membrane of the mouth. There was, consequently, none of the distress which, in the first instance, necessarily results from dividing the whole thickness of the cheek, such as discharge of blood and saliva, inability of speaking, and difficulty of deglutition. The jaw, which had been previously locked, was at once set free, and the patient not only spoke with perfect ease, but swallowed her food as if the jaw had not been concerned in the operation. She also experienced none of the secondary inconvenience which is apt to ensue from lateral displacement of the jaw, through inequality of the muscles acting upon it. There was no constitutional derangement, and the wound healed almost entirely by the first intention.

I am not acquainted with any other instance of the ramus of the jaw being disarticulated without opening the cavity of the mouth; and though the circumstances admitting of this operation must doubtless be very rare, I think it right to place the case that has been related on record, as evidence that when a maxillary tumor is limited to the ramus, it may be removed on easier terms for the patient than have hitherto been deemed practicable.

Nothing could be more satisfactory than the condition and prospect of this case for some time after recovery from the operation. I regret to say, however, that, not many months subsequently, the glandular system became affected, and gave rise to a large swelling, which involved the bones of the face, and at length proved fatal.

The following case is deserving of mention on account of the great length of time during which the patient labored under a tendency to the disease, and the effect of repeated operations in ultimately relieving him from it.*

In the second volume of Mr. John Bell's "Principles of Surgery," page 180, a case is related of which some extracts will be sufficient to give an idea of its most important features.

"A young gentleman, Mr. H——, about twenty-five years of age, of an athletic form and healthy constitution, and without the slightest taint of disease, hereditary or acquired, had, from no perceptible cause, a tumor, firm, cartilaginous, and elastic, seated so fairly in the center of the gums as to raise the two center teeth of the lower jaw from their sockets far above the general range of the teeth, and separate the two that lay adjacent."—"The tumor was about the size of a walnut, irregularly globular, knobby, and shining."—"A tyro must have believed it to contain a fluid."—"I was well aware that not a drop of fluid would follow a puncture, that the tumor inflaming, would turn out its edges, spread into a fungus, and in a few months cause a horrible and melancholy death."—"Dr. Monro, Mr. Allan, and myself, having consulted on the nature of this tumor, declared it to be of a most dangerous nature."—"We explained to our patient that it contained no fluid,—was incapable of suppuration,—was sure to become cancerous,—admitted of no delay,—and that we dared not do less than extirpate it from the very root." Mr. Bell describes the operation, and represents by drawings the appearance of the tumor, both before and after the operation. He used "a scalpel of special strength." "All my strength of hand was requisite to carry the knife down to the angle."—"I cut with such decision, with such level lines, and made them so fairly meet with each other in the angle, that by pressing my two thumbs, one within side of the tumor, the other without, I pushed it out clear and unmangled."

"This gentleman is perfectly cured; the gums and adjacent teeth firm and sound; and I confess I could not reflect on the structure of this small tumor without saying within myself, What would have been the state of this tumor in three months? What would have been his

* Edinburgh Medical and Surgical Journal, 1831.

state in six or eight? In its second stage, in little more than three months it must have filled the mouth with a fetid bleeding fungus! In eight or ten months it must have assumed the perfect character of incurable loathsome cancer!"

It is evident that Mr. Bell did not make the distinction that seems to be required between the medullary sarcomatous and cartilaginous growth of bone. If this tumor had been of the former kind, the result of his operation would not have been so satisfactory, and he would probably have had to encounter the fungous excrescences he so impressively describes. As it was, the morbid disposition still remained, and, after lying long latent, at last showed proof of its existence. About twelve months ago, that is, twenty-two years after Mr. Bell's operation, this gentleman applied to me on account of a tumor, which so precisely resembled the one described by Mr. Bell in size, situation, appearance, and consistence, that the engraving in his work would have answered equally well for representing it, with the exception of the two front incisors being absent. He stated that the swelling had commenced some months previously, and was increasing. He had little or no pain, but a sort of uneasiness about the mouth, and numbness of the lip.

In consultation with Dr. Shortt and Mr. Nasmyth, it was resolved to cut out the tumor again, and this was accordingly done. It then appeared that the morbid formation descended into the interstices of the bone, and when, by means of the cutting-pliers and gouge, nearly the whole thickness of the jaw at the part concerned had been removed, the exposed surface still showed cells filled with the same unhealthy substance. It was now evidently the most prudent course to saw through the bone on each side of the affected portion. But this proceeding was much more severe than the patient or his friends contemplated; and as the former operation, though not radical, had afforded so long an interval of freedom from visible disease, it did not seem warrantable, and therefore the actual cautery was applied very freely in its stead.

The wound healed kindly, and the cure seemed to be complete. At the end of two months, however, the patient observed that there was more than usual fullness under the tongue, and it soon afterward became obvious that the tumor was growing again along the whole extent of the jaw concerned in the former operation. The propriety of removing the affected part of the jaw was now strongly represented to the patient. He then consulted a person, who, for several weeks, made him believe that the external application of ointments would remove the swelling. Being at length awakened from this delusion by

the decided opinions of Drs. Ross, Shortt, and Hunter, Sir George Ballingall, Mr. Nasmyth, and myself, he submitted to the operation, which was performed in the usual way. The jaw was divided on the right side, opposite the second bicuspid tooth, and on the left, immediately anterior to the last grinder; but as it appeared that, though the external part of the bone was sound here, a process of the cartilaginous growth extended into its center, another portion was taken away, so that nothing but the ramus was left on this side. The wound healed everywhere by the first intention—on the ninth day the patient shaved himself, and he has remained since perfectly well. Five months have now elapsed, and he seems to be safe from any relapse. He speaks with perfect distinctness, and is so little altered in appearance that no one would suspect anything unusual in the state of the mouth.

Had this tumor been left to itself, it would not probably have led to the frightful consequences anticipated by Mr. Bell, but rather have gone on increasing in size, like the similar growth which was removed from the young man Penman, after repeated ineffectual attempts had been made to excise it, and being ultimately allowed to grow until it weighed four pounds and a half.

In 1836 this gentleman applied to me for the removal of a tumor in his cheek, near the chin, on the same side from which the bone had been taken; and in 1837 he again came under my care for a rather formidable-looking fungous growth, the size of a small walnut, under his tongue. This tumor also was dissected out. He then enjoyed good health, and died last summer (1847) without having had any return of the disease.

XI.

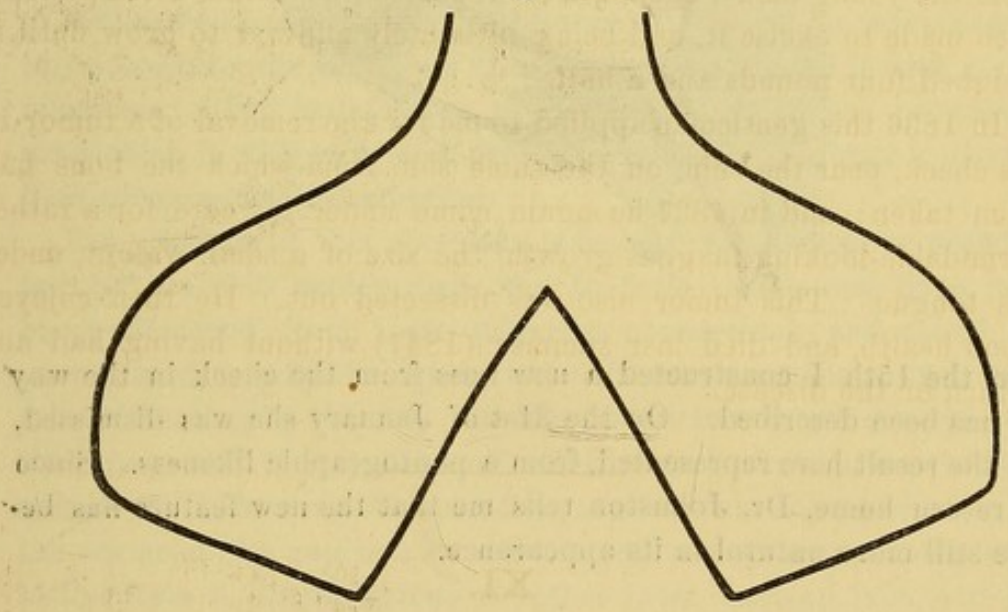
RESTORATION OF THE NOSE.

There certainly is no feature which, by its removal, so completely disfigures the human countenance as the nose, and its restoration has accordingly long been regarded as an important object of surgery. Of the plans proposed for this purpose, the wild scheme of Taliacotius need not be taken into consideration; and the Indian or frontal method, which is the only other recognized by most surgical writers, has always seemed to me very objectionable, not merely on account of its deforming the forehead, but from its placing upon the face an unseemly appendage having little resemblance to a nose by its color,

consistence, form, or composition, and from being necessarily tucked up between the eyes above the proper level of its root. The nose thus constructed must also have its sensations in correspondence with the part from which it was derived, and consequently forms a constant source of annoyance to the patient, who finds that he has exchanged a negative for a positive evil. Instead of so questionable a substitute, I think a truly artificial one greatly preferable. It may be composed of silver or gutta-percha, and being secured in its place by spectacles or slips of some adhesive tissue, enables the patient to go into society with a considerable degree of comfort.

About fifteen years ago, it occurred to me that surgical relief might be effected in such a way as to obviate the objections above stated with regard to the operations previously in use, and the method then suggested, when tried in practice, was found to surpass my most sanguine expectations. It consisted in making two flaps of skin from the cheeks,

Fig. 24.



of this form, uniting them in the middle by three or four sutures, and then fixing the outer edges on each side to the raw surface at a proper distance from the nasal orifice. The wounds of the cheek admit of being nearly closed by a stitch through the edges of each, and what remains of them is of use by the contraction of the granulating process depressing the hollow at the side of the nose, and thus increasing its apparent elevation. The cavity should be gently distended with lint, compresses of the same being applied on each side externally, and supported by the blades of a small pair of forceps applied so as to embrace the nose longitudinally.

A. S., aged eighteen, recommended to my care by Dr. Johnston of Montrose, was admitted on the 13th of December last, for the restoration of her nose, which had been destroyed by disease, in childhood, so completely that it presented no projection when viewed in profile, the bone having suffered as well as the cartilage.

Fig. 25.

On the 15th I constructed a new nose from the cheek in the way that has been described. On the 31st of January she was dismissed, with the result here represented, from a photographic likeness. Since her return home, Dr. Johnston tells me that the new feature has become still more natural in its appearance.

XII.

RESTORATION OF THE LOWER LIP.

Although absence of the nose may occasion a more unseemly disfigurement, it would appear that removal of the lower lip gives rise to greater and more complicated inconvenience, by impeding articulation and mastication, by allowing the saliva to dribble incessantly, by withdrawing support from the teeth, which are consequently pressed out-

ward by the tongue, and by exposing them to cold, which causes painful sensations of the most distressing kind. To obviate these effects, the patient is obliged to wear a compress and bandage, which must cause discomfort in other respects. It might, therefore, be expected that the surgical means of remedying this defect would have long ago been perfected, but even so lately as the last edition of Mr. Liston's "Practical Surgery," it will be found that the plan then in use was to twist round a triangular flap of skin from under the chin, so as to present the hair to the mouth, and entirely disfigure the patient, unless the distorted integument sloughed, which it was much more apt to do than exist in such unfavorable circumstances.

Soon after devising the process for restoration of the nose, I thought of applying the same principle to supplying deficiency of the entire lower lip, and since then in numerous cases have met with the most satisfactory results. Indeed it would be difficult to mention any surgical operation that affords a greater amount of relief at a smaller expense of suffering. Nevertheless, and although the operating theater of Edinburgh has year after year borne witness to the advantages of this procedure, the compilers of systems have treated it with cold indifference, either maintaining silence in regard to the proposal, or mentioning it with such faint praise as must tend to deter from rather than encourage to its adoption.

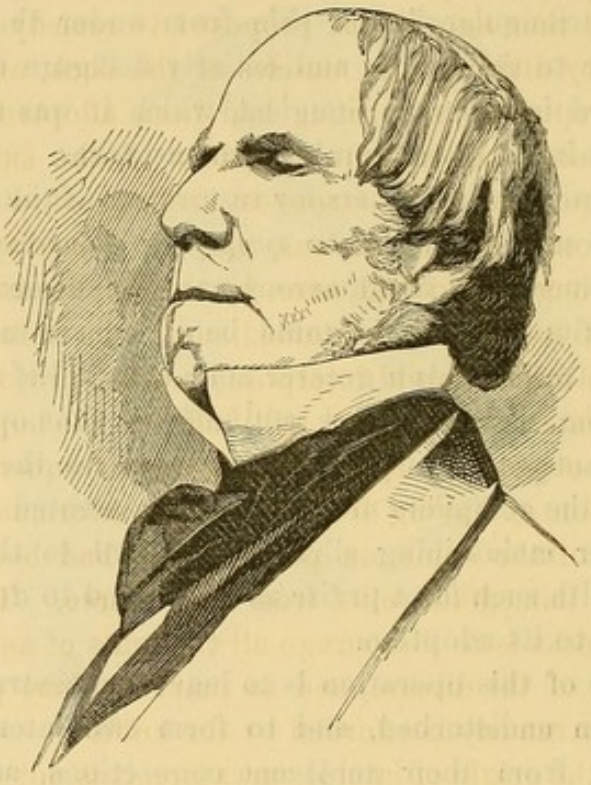
The principle of this operation is to leave the central or prominent part of the chin undisturbed, and to form two lateral flaps, which being detached from their subjacent connections, and raised to a proper level, supply the defect, while the whole extent of incision admits of healing by the first intention, so that the patient has sometimes been able to shave himself within a week after having the lip restored. In performing the operation, two incisions should be made from the center of the gap in a straight direction outward and downward, in this form Λ, to the extent of rather more than an inch, and from each of the lower ends the knife is carried outward and upward in a curved line sufficiently far to complete the flaps of this shape ⌣Λ⌣, which are then raised so that the two straight portions formed in the first instance meet together in the middle line, where they are united by sutures, which also maintain all the other cut edges in contact, while the prominence of the chin, retaining its natural connections, serves as a support for the new lip.

R. B., aged 62, recommended to my care by Dr. Anderson of Selkirk, was admitted on the 9th of November last, on account of an epithelial cancer, including the whole of the lower lip.

On the 21st, I removed the whole of the disease by two incisions

from the angles of the mouth to the prominence of the chin, and from this point cut on each side, at first downward and outward in a straight line, and then in a curved direction outward and upward, so as to form the flaps, which were detached, raised, and united in their proper position by silver sutures. The whole extent of incision healed

Fig. 26.



by the first intention, and the patient was dismissed on the 7th of December. Since his return home, Dr. Anderson has kindly sent me the photographic likeness, which is here represented.

XIII.

ON LATERAL CURVATURE OF THE SPINE, AND WRY-NECK.*

The following paper was published at a time when the recent introduction of "Tenotomy," or the subcutaneous division of tendons and muscles, had so dazzled not only the profession but the public, that every proposal for its application met with a ready reception, and no

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* From the Edinburgh Monthly Journal, April, 1843.

statement as to its success seemed incredible, however much it might be opposed to reason and common sense. In the sounder state of judgment upon the subject which now exists, the language employed may appear unnecessarily strong. But as my testimony against the practice in question was quoted in the journals of Paris, where it originated, and may have had some influence in promoting its discontinuance, I reprint the paper without alteration.

When, some time ago, it was proposed to remedy lateral curvature of the spine by dividing the muscles of the back, and when cases in which this preposterous practice had been adopted were published, every honest and well-informed member of the surgical profession must have experienced the strongest feelings of disgust and indignation. The only consolation was, that the absurdity of the proposal could not be long overlooked, even by the public, and would prevent much mischief from being sustained, until the salutary influence of time over such follies should interpose its usual protection of oblivion. But though years have passed, I still find that the hopes so improperly excited have not yet been abandoned, and am frequently placed in the painful situation of having to decline the performance of operations for curvature of the spine, on patients who had been led to expect complete and immediate relief from this source. The object of the following remarks is to discourage all thoughts of an operation in the ordinary form of the disease, and to point out one particular case in which the only remedy is afforded by the knife.

In tracing the origin of lateral curvature, it is not easy to determine whether the muscles or the bones should be considered chiefly in fault. The former, through weakness or injurious habits, allow the spine to assume a bent shape; and the latter, from deficiency of their ordinary rigidity, yielding to the unequal pressure thus occasioned, suffer a corresponding distortion. Sex, age, and tight lacing may conduce to these effects; but they are doubtless promoted in no small degree by the enervating influence of modern education, which strains and overfatigues the mental faculties at a period of life when energy of body, the moral sentiments, and powers of observation should rather be cultivated. This pernicious system not only destroys the appetite for wholesome study at its proper season, but seriously endangers health, and in all probability contributes to the present frequency of spinal complaints.

So long as the bones preserve their natural forms, the patient, by a voluntary effort, or by assuming the horizontal position, can at once make the curvature disappear; and if care be at this time taken, by attention to the general health, the disuse of stays, avoiding sitting

or standing still, and frequently reclining on a flat surface, the distorting process may be easily and certainly arrested. It too frequently happens, however, that when a medical man is consulted at this stage of the complaint, finding the bones unaltered in shape, and the spine readily straightened, he is misled to form and express an opinion that there is nothing really wrong. He attributes the apprehension to overanxiety, and dismisses the case with the comforting assurance that it will soon be all right. At length the bones do give way, the curvature can no longer be rectified, the ribs become flattened, the sternum projects, and the sad truth being then too apparent, means of remedy are sought for on all sides. But the time for beneficial interference has unhappily gone by. The exercises which formerly might have *prevented* the curvature, must now tend to increase it, by the superincumbent pressure of the head and shoulders, while the invigorating measures which might have fortified the bones against the distorting influence must confirm them in the faulty forms they have assumed. Mechanical support in the erect posture is worse than useless, since it impairs the muscular power that remains, without effectually relieving the trunk from pressure; and the complicated apparatus for effacing the deformity, by pulling, squeezing, and exercising in the horizontal posture, though certainly more plausible in theory, if I may judge from the results of such practical trials as that I have happened to witness, owe more of the credit placed in them to the confident statements of their respective projectors, than to the improvement they have actually accomplished.

It is no wonder, then, that when an operation for the cure of confirmed lateral curvature was proclaimed as safe, speedy, and effectual, the hopes of all interested in the complaint were powerfully excited. This operation consisted in dividing certain muscles of the back, on the contracted state of which it was alleged the distortion depended. But nothing could be more erroneous than this view of the case, since the muscles throughout its production and existence are entirely passive. They from the first do not draw the spine away, but allow it to bend, their fault being weakness, and not undue contraction; so that those requiring to be corrected are seated on the convexity of the curve instead of its concavity, and, it is needless to add, could not be strengthened by division of their substance. The operation, therefore, should be banished from respectable practice, and if it survives this merited disgrace, be committed to those members of the profession who are base enough to take advantage of their patients' credulity for the sake of gain or unworthy notoriety.

But there is one particular condition of the complaint certainly not

common; yet, judging from the number of cases that have fallen within my own observation, I should say not extremely rare, in which complete relief may be afforded by the division of a muscle, and in no other way. I allude to spinal curvature depending upon wry-neck caused by contraction of the sterno-mastoid. This muscle is liable to contraction, both spasmodic and permanent. The former does not, so far as I have seen, affect the shape of the spine, and, in two cases treated by division, did not yield to the operation. But the latter is apt to produce lateral curvature in every degree, and may be remedied with no less ease than certainty by subcutaneous incision.

Wry-neck, like club-foot, is sometimes congenital, but much more frequently, like squinting and the *pes equinus*, occurs during childhood, in connection with some inflammatory or feverish state of the system. It depends upon a contracted state of the sterno-mastoid muscle, which has usually the feeling and appearance of a tense cord stretching from the clavicle to the ear. The head is bent toward the side affected, the face being turned in the opposite direction. Until the introduction of subcutaneous incision, the treatment of this complaint was very defective, since it consisted either in the use of mechanical support, which did little, if any good, or in cutting across the contracted muscle, together with its superjacent integuments, which was a painful and bloody operation, leaving a large sore, slow to heal, and apt to renew the evil during cicatrization. The subcutaneous process requires merely a puncture of the skin, is not attended with pain or bleeding, needs no dressing or after-treatment, and at once affords the relief desired. The following is the first case on record of its performance in Great Britain, which I extract from my tenth report of the Edinburgh Surgical Hospital:

"*Wry-Neck, depending on Contraction of the Sterno-Mastoid, remedied by Division of the Muscle.*—Matthew Cullen, aged six, Dunbar, admitted November 2, 1832. The head was much inclined to the left side, and could not be elevated, owing to the rigid contraction of the left sterno-mastoid, the sternal part of which felt like a tense cord. The complaint had existed upwards of twelve months, and had resisted blisters, with other similar means of remedy. In these circumstances, it was thought necessary to divide the contracted part of the muscle. This was effected by entering a sharp-pointed narrow knife a little to the inner side of its tracheal margin, about an inch above the clavicle, and then pressing the blade against the tense fibers. A sudden snap, which shook the patient's frame, was immediately perceived, and all trace of the contraction disappeared. The knife was withdrawn, and the small puncture occasioned by it in passing

through the skin afforded the only perceptible indication of what had been done. No pain or other bad consequence followed, and the cure might be regarded as at once complete."*

In the case just related, the disease existed in its simplest form, and without any spinal affection, which is seldom wanting. The affection of the spine proceeds from involuntary elevation of the shoulder on the side affected, to lessen the strain on the head. This necessarily gives the dorsal part of the spine a corresponding convexity; and the lumbar portion bending in an opposite direction, to preserve the balance of the trunk, there results a lateral curvature, in no respect different, so far as regards appearance, from its ordinary condition. I was asked, along with Sir Charles Bell, to see a young gentleman suffering from lateral curvature. Finding the right sterno-mastoid very much contracted, I proposed to divide it, and did so with the effect of correcting the state of the spine immediately, so that before we left the house the youth was walking straight.

But if the distortion be permitted to continue, it sooner or later, as in the ordinary form of the disease, leads to alteration in the shape of the bones. The bodies of the vertebræ are compressed, and the sternum projects. In this case, of course, the operation cannot afford the same instant relief that follows its performance while the curvature depends merely upon muscular action. The head, however, is at once set free, to the patient's great comfort; and, through the gradual improvement of time, the trunk, unless arrived at full maturity, may in a great measure regain its proper conformation. A few weeks ago I saw, with Mr. Cruickshank, of Hill Place, a young lady from this neighborhood, on whom I performed the operation in January, 1841. The back and ribs were then so much distorted that I hardly ventured to hope for much improvement, especially as the patient was nearly twenty years of age. It was therefore an agreeable surprise to find, instead of the low, thin, sallow, crooked, sickly-looking girl I had formerly seen, an erect, fresh-colored, happy, healthy-looking young woman.

There is still another condition of the complaint, of which I may mention an instance that came within my notice last summer, in the case of a boy who was brought from the country on account of lateral curvature. Observing that his head inclined to one side, I examined the sterno-mastoid, and found it, not tense and rigid as I expected, but soft and yielding. I perceived, however, that when an attempt was made to raise the head, the muscle resisted and became tense, and

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* Edinburgh Medical and Surgical Journal, p. 115.

therefore concluded that it was the seat of the evil. Under this impression I proceeded to divide it, and succeeded in doing so, though with more difficulty than usual, from the want of tension, for which it was necessary to compensate by stretching the neck. A good effect was immediately perceptible, and the following day the patient's back was comparatively straight, which it has since, I am informed, become completely.

In concluding these remarks, it may be well to warn against mistaking for wry-neck depending upon muscular contraction, the distorted position of the head which proceeds from caries between the occiput and atlas. The latter disease, like the former, usually occurs in young persons, presents to a careless observer similar symptoms, and, if confounded with it, leads to treatment not only useless, but extremely injurious. A young gentleman had for twelve months used friction and exercise under the direction of his medical attendant, who supposed that he labored under wry-neck from contraction of the sterno-mastoid. No benefit having been experienced, it was thought that an operation might be serviceable, and with this view I was asked to see the patient. He presented all the characters and well-marked symptoms of *spondylarthrocace*, or caries of the occipito-vertebral articulation, in a stage so advanced that there was nothing left for me but to explain the nature of the case and predict the fatal termination, which soon afterward happened.

Since the publication of this paper I have operated in several other cases with the same success, and without ever causing any unpleasant symptoms. In no instance has it ever been necessary to divide both the clavicular and sternal portions of the muscle, and in the course of my experience, only one case requiring division of the former has occurred.

There is a spasmodic contraction of the sterno-mastoid, fortunately of rare occurrence, but which requires to be carefully distinguished from the ordinary form of the disease, as dividing the muscle for it affords no relief. I have met with only three cases of this kind. In one of them, the patient, a gentleman whom I saw with the late Dr. Shortt in 1828, had the sternal part of the muscle divided, together with the integuments, without experiencing any permanent benefit. In another case, seen along with Sir C. Bell and Dr. Scott, I also divided the muscle, but by subcutaneous incision, and without any benefit at the time, although the patient, a gentleman from Roxburghshire, I have been informed, afterward recovered spontaneously. The characters which distinguish this form of wry-neck are so strongly marked, that they cannot be overlooked even by one who has not seen similar cases before.

XIV.

SPASMODIC STRICTURE AND FISSURE OF THE ANUS.

The expressions "muscular contraction and ulcer of the anus," would more correctly denote the condition to which the titles above mentioned have been applied, since the tightness is not variable or fitful, and yields to a mode of treatment that proves ineffectual when employed for the spasmodic affections of other parts, while under fissure cannot well be included a form of the disease, by no means rare, in which the sore is seated entirely within the sphincter. M. Boyer, to whom we are indebted for the first systematic account of both the derangements in question, described them as almost always existing together, the contraction being seldom, and the ulceration never, found alone. He therefore concluded that the former was probably the primary, and, at all events, the dominating disease, and felt confirmed in this opinion by observing that whenever the contraction was removed the ulcer healed. His treatment, consequently, was directed to the muscle, and consisted in dividing it completely by a free incision throughout the whole of its extent. This was a formidable procedure, and required in general six weeks or two months for recovery, but nevertheless, from proving effectual, appeared fully warranted by the severity of the patient's suffering, and thus became the established rule of practice.

At an early period of my own experience, I ascertained that a complete division of the sphincter was not requisite for the purpose, and found that it was hardly necessary to extend the incision beyond the mucous membrane of the bowel, or a few of the tense muscular fibers adjoining the base of the ulcer. The best way of accomplishing this is to introduce the finger, so as to feel the fissure or internal ulcer distinctly, and then applying the point of a small straight or curved bistoury at the margin of the anus, to push the knife upward, with its edge directed inward, until it passes through the whole extent of the disease and converts the sore into an incision. The cut thus made is very small, and requires no dressing beyond the introduction of a piece of lint, which may be allowed to remain until the bowel is evacuated. If there is much contraction along with the fissure, or if it exists independently of this complication, the same procedure should be adopted, with the difference of introducing the point of the knife beyond the ring of constricted fibers, felt by the finger, that has been placed in the rectum. For this purpose, it is never necessary to com-

mence the incision farther than an inch from the anus, so that in no case need it exceed a very limited extent, or such as to require any subsequent treatment in the way of dressing.

The credit of this improvement, although, so far as I know, not claimed by any other person, has been erroneously attributed to various sources of long posterior date to the time when I first taught and practiced it. The following letter from Dr. Duncan, late Senior Ordinary Surgeon of the Royal Infirmary, who attended my clinical lectures in 1832, will, I trust, afford conclusive evidence of the priority in question.

12 Heriot Row, June 11, 1861.

My dear Mr. Syme:—At your request I put in writing what I stated to you as to your teaching on fissure of the anus when I was your pupil, at Minto House Hospital.

You then taught that it was unnecessary to divide the whole sphincter, that the incision should be very limited, and that in fact all that was necessary was to convert the fissure into a simple incision. I have notes on the subject, although I cannot at present lay my hands on them, but my recollection of the matter is clear. Yours, etc.,

James Duncan.

The following case of a much-respected member of the profession will show that my practice continued to be the same at a later date, though still long before the period at which this mode of procedure has been supposed to have originated:

Dr. A. of A. to Mr. Syme.

Although it is now upwards of twenty years since you operated upon me for fissure of the anus (if the trifling incision you made can be called an operation), I have a distinct recollection of the circumstances of my case.

I had been ill for many months before putting myself into your hands. During most of that time I had suffered intensely, so much so that I became unfit for anything. I could not attend to my work, for I could neither think nor sleep. It was particularly unpleasant for me to be in society, on account of my extreme *unrest*. I was constantly fidgeting about, and sitting with one hip on my chair. That was the posture that afforded me most relief during the day; and, at night, my only chance to sleep was afforded by separating the *nates* forcibly with my hands, as if trying to keep the anus open—the sphincter being all the time forcibly contracted, so that scarcely a vestige of the anus could be seen. I remember one thing particularly which I have not seen

stated by writers on fissure, namely, that the pain always appeared to me to be higher up in the rectum than the seat of the fissure, which you found just within the anus. My suffering at stool, too, was greater than that generally described. Although I can bear pain as well as most people, the perspiration used to burst out upon me when at stool. The pain at that time was pure lancinating pain, which soon became, as it were, mixed with intense itching, in which state it continued for hours after every evacuation of the bowels; and if after that my suffering abated a little, it was *only* a little, for I was always miserable.

You at once detected the cause of my misery, and cured it as if by magic. Of course, I could not see what you did, but, so far as I can recollect, you said that you only divided a little bit of the mucous membrane and the subjacent cellular tissue in the line of the fissure, so as to convert the fissure into a simple incision. Little or no pain attended the small operation. Indeed, the sensation caused by the knife was comparatively pleasant. You then introduced a small piece of lint into the wound, and advised me to endeavor to refrain from going to stool for two days, and after that to take a dose of castor oil. The cure was instantaneous and complete. I never felt the pain again. The castor oil, which I took according to order, operated freely, after I had enjoyed two nights of sound sleep, to which I had long been a stranger. I returned home about the third day after the operation; and, although I had to cross the Firth of Forth in a gale of wind, and then to travel fifty miles, I felt no inconvenience, but was able to return to my work immediately on my arrival. D. A.

XV.

FISTULA IN ANO.

The surgical history of fistula in ano is both curious and instructive. In old times, when the characteristic obstinacy of this disease was attributed to some peculiar condition of the morbid surface, it seemed requisite to destroy or remove the lining membrane throughout its whole extent by caustics or excision. Even now there is reason to believe that this severe treatment has not yet been univerally abandoned, since, at no distant date, the scooping out of a fistula might still be witnessed in the metropolitan hospitals of a neighboring country,

and there was very recently under my care a gentleman who came from Sweden to obtain relief from a complaint of the kind in question which, he told me, had resisted twenty applications of the chloride of zinc. In this country a better system was long ago introduced through the clear and forcible exposition of Mr. Pott, who explained that the difficulty of healing proceeded not from any peculiarity of vital action in the texture, but from the mechanical obstacle presented by the thin septum that lay between the fistula and bowel, of which the simple division was sufficient to insure recovery.

The principle of treatment thus established, though greatly superior to the old practice, was far from being perfect, since it required that the septum should be divided throughout the whole of its extent, which could not be done without considerable pain and trouble, the risk of hemorrhage, and a tedious recovery,—with careful dressing of the wound to prevent its edges from adhering prematurely. But in 1820, M. Ribes made known a most important observation, which led to a great improvement of practice. This was, that the internal aperture of a fistula, instead of being variable in its position, as had been supposed, is always situated within an inch, or very little more, from the anus, and that division of the septum merely to this extent may be regarded as an effectual remedy. It must be admitted, that along with these valuable contributions to pathology and practice, M. Ribes conveyed two very serious errors—by maintaining that the internal opening was always present, and that it was formed, in the first instance, by ulceration of the mucous membrane, so as to produce an abscess, by allowing the escape of intestinal matters into the cellular texture. That both of these positions are untenable, may be proved beyond the possibility of question, by examining the cavity of an abscess which gives rise to fistula soon after it has opened externally spontaneously, or been evacuated by incision. It will then be found, by inserting a finger into the rectum and a probe into the sinus, that the mucous membrane, though to more or less extent denuded and extremely thin, is at that period *always quite entire.*

Having had my attention directed to the observations of M. Ribes soon after their publication, and ascertained the accuracy of his statements in regard to the position of the internal orifice and the efficacy of a limited incision, I was surprised to find his views so inconsistent in other respects with matters of fact admitting of such easy recognition; but could not doubt that, with the exception of some rare cases in which the abscess opened primarily into the bowel, the aperture in the mucous membrane was always of secondary formation, through ulceration taking place subsequently to evacuation. It may

be added that the nature of the matter contained in the abscess, which is usually small in quantity, and simply purulent, cannot be reconciled with the idea of M. Ribes, or the similar view more lately expressed by Sir B. Brodie (1844), that the first step is ulceration, allowing the escape of intestinal contents; since the result of such an occurrence would certainly be a great accumulation of fetid matters, gaseous as well as liquid, and totally different from what is found when the abscess is opened. But any such argument is quite unnecessary in the treatment of a question admitting so easily of positive demonstration.

From three to six weeks may be considered the usual length of time required for the establishment of an internal aperture, although a longer period occasionally elapses before its production, especially when the abscess has been opened by a free incision, as the confinement of discharge, that probably gives rise to absorption of the septum, will then, of course, be more slowly induced. From this observation, the practical inference follows that, in operating upon a patient who has no internal opening, it is merely necessary to divide the septum up to that thin portion of the mucous membrane where the aperture would be if there were one.

In performing the operation a considerable difficulty is frequently experienced in detecting the internal orifice, from its not lying in the same line with the external one. I think the best plan is to bend the probe, after being passed through the opening into the bowel, and bring its point out at the anus, when the single stroke of a sharp knife is sufficient for its extrication. A piece of lint is then placed in the wound, and allowed to remain two days; after which no precaution or treatment of any sort is required beyond ascertaining once or twice, by passing a finger or the probe into the wound, that it is healing by contraction and not adhesion.

Although the operation, when thus performed, may be regarded as the perfection of simplicity and efficiency, it does not seem to afford any security from the foolish proposals of would-be improvers, as will appear from the following example: Not long ago a gentleman came to me from Liverpool for the remedy of a fistula in ano, on account of which he had suffered much pain and useless confinement, through the representations of a practitioner who described the operation as too dreadful for human endurance, and held forth the injection of iodine as an effectual substitute for it. This fistula, being of the slightest and simplest kind, was remedied by an incision so trivial that the patient was not aware of its performance, and could with difficulty be made to believe that the process was completed; while instead of the protracted stay in Edinburgh, to which he and his wife had made up their

minds, he returned home at the end of four days, so well satisfied with his expedition that he soon afterward recommended to my care a friend similarly afflicted.

XVI.

INTERNAL HEMORRHOIDS AND PROLAPSUS ANI.

So lately as thirty years ago the treatment of internal hemorrhoids was feeble and uncertain, few practitioners venturing to interfere with them, and never doing so but under a painful feeling of anxiety. Sir A. Cooper, in his lectures, relates various cases of death from hemorrhage caused by excision of the tumors, and speaks of tying them as hardly less free from danger; so that, with the fear of bleeding on the one hand, and of inflammation on the other, both the scissors and the ligature were equally dreaded. My attention having been directed to the subject while it was in this unsatisfactory state, I found that the bad effects which had been attributed to the ligature proceeded from the faulty mode of its application, and were more especially due to the erroneous practice of neither including the whole of the morbid growths, nor tying them so tightly as to insulate them from all communication with the living tissue. Both of these errors originated from the desire of lessening pain and protecting the patient from the effects of excessive irritation, but were in truth completely opposed to the objects in view. For the tumors allowed to remain were apt to inflame, while the portions of them that had been merely strangled necessarily did so in consequence of the obstructed circulation. The application of a ligature, says Sir A. Cooper, "is exceedingly painful if it be drawn tightly;" and so said Sir Charles Bell, with other surgeons of eminence. To the directly opposite conclusion I was led by observing the very different effects of partial and complete strangulation on the same patient, and therefore adopted the principle of so far as possible including every part of the hemorrhoidal enlargement in the ligatures, and drawing them with the utmost practicable degree of tightness. The process is thus rendered either entirely free from pain, or attended by such a slight degree of it as easily admits of being counteracted by small opiates. I have repeatedly had under my care patients who, having been imperfectly relieved by the old-fashioned mode of ligature, were with great difficulty induced to submit again to what their former experience led them to suppose would

be extremely painful; but who were agreeably disappointed on finding that it could be so conducted as not to occasion any suffering worthy of mention.

When the facility, efficiency, and safety of this method are considered, it seems surprising that any other means of treatment should still be entertained. Yet there can be no doubt that many practitioners are in the dangerous condition of hesitating between the use of caustics and excision, both of which are apt to prove fatal by inducing inflammation of the mucous membrane or veins.

When internal hemorrhoids are protruded from the anus, not only during evacuation of the bowels, but through ordinary exertions in the erect posture, they generally receive the appellation of "Prolapsus ani," and being attributed to imperfection of the sphincter, are supposed to admit of only the palliation afforded by mechanical support. With the possession of such a perfect means of remedy as that afforded by the ligature, it is melancholy to reflect on the amount of misery thus so unnecessarily endured, as may be illustrated by the following case: A most respectable and well-known member of the medical profession in this city asked me to see a lady suffering from Prolapsus ani. Upon doing so I found merely some internal hemorrhoidal tumors, and removed them by ligatures, with complete relief. The doctor, very much astonished at this result, told me that he had labored under the same complaint for twenty years, and during the whole of this period endured the intolerable nuisance of a bandage as the only means of enabling him to undergo the fatigues of an active life. No time was lost in removing his infirmity, and although several years have elapsed since this was done, I am happy to say he still enjoys the most perfect health. That a man of intelligence, who has written much for the medical instruction of others, should have made such a mistake, shows how strong is the tendency to it; but the best measure of its frequency may be gathered from the advertisements of mechanical support for the relief of prolapsus, which may be seen in every newspaper and every periodical medical print. It is thus rendered evident that there must be an extensive demand for these machines, of which it may be said with certainty that at least 99 in the 100 are employed under an entire misapprehension of the case; and in the belief that the complaint is incurable, while, on the contrary, it admits of easy, safe, and effectual remedy.

XVII.

HEMORRHAGE FROM THE RECTUM.

Internal Hemorrhoids are so generally the source of bleeding from the rectum, that hardly any others appear to have been noticed by writers on the subject. But having frequently met with the most profuse and obstinate hemorrhage when there was not the slightest trace of internal piles, I think it is very important that attention should be directed to some morbid states of a different kind, which may give rise to this occurrence. Of these, the one most frequently concerned is that of external hemorrhoids.

That pendulous flaps of skin hanging round the anus should give rise to a serious flow of blood, seems in the highest degree improbable, and might indeed be deemed altogether incredible, were it not proved beyond the possibility of question, by well ascertained facts. It is now more than thirty years since I became aware that external piles, independently of any other morbid condition, might be the cause of bleeding, through the observation of a case in which, although the patient had been rendered almost exsanguine, the most careful examination failed to detect any other derangement, and complete relief was afforded by its removal. Since then, both in public and private practice, I have had very many opportunities of observing similar facts, and of these may select the two following as sufficiently illustrative for the purpose:

Mr. Craig of Ratho to Mr. Syme.

My dear Sir:—The operation performed on Mr. D. in July, 1845, was most successful. He was then forty-seven years of age, and looked quite anæmic, having for many weeks lost a large quantity of blood at stool; the amount had daily increased, but the most careful examination of the anus and rectum revealed nothing more than a quantity of loose skin external to the orifice. When he sat upon the stool in our presence, pure blood to the amount of several ounces was speedily discharged, and formed a cake of coagulum in the utensil. You merely removed the whole of the loose skin by scissors, saying that you had reason to believe this would prove sufficient, and the result was a complete and permanent cure, as the patient never passed any more blood, and is still in good health.

Yours, etc.,

James Craig.

Ratho, 1861.

DR. PATERSON TO MR. SYME.

MY DEAR MR. SYME:—The Rev. Mr. ——labored under large and exhausting discharges of blood from the rectum, which had been going on for years. As there were some external hemorrhoids, you considered that these were most likely the cause of the hemorrhage. They were accordingly removed, since when there has been no bleeding whatever; and nearly six months have now elapsed since the operation.

Yours, etc.,

LEITH, 31st May, 1861. ROBT. PATERSON.

How the presence of external piles causes bleeding from the bowel, or how their removal prevents it, I am quite unable to explain; but do not, on this account, regard these facts as of less importance in practice. If their occurrence were extremely rare, they would be of less consequence; but happening so frequently, as I have had occasion to see, their recognition is obviously a matter of no small practical importance.

Another source of hemorrhage from the rectum, which could not have been readily suspected or anticipated, is spasmodic stricture of the anus. The fissures and ulcers which are so frequently connected with this condition usually discharge a little blood, although hardly in such quantity as to constitute a prominent feature of the case; but, independently of any such complication, a mere contracted state of the sphincter may occasion the most profuse and serious bleeding. As an instance of this effect, I may mention a very remarkable case that was presented to me, not long ago, by a medical student of great talent and diligence. He complained of bleeding at stool, but, on examination, was found so perfectly free from hemorrhoidal disease that I supposed he must labor under a delusion. Some time afterward, remarking that he had become extremely pale and emaciated, I was led to make further inquiry, and then learned from a companion, who resided in the same house with him, that there really was a copious discharge of blood, which issued in a fluid state and then coagulated. On making another examination, I found that the external part of the sphincter was tightly contracted, and knowing that this might be the cause of bleeding, made a division of the tight muscular fibers. No blood was subsequently discharged, and the patient soon regained his healthy aspect.

There is still another source of hemorrhage from the rectum, of which I have met with only one example. The patient was a young

lady whom I saw along with the late Dr. Graham, the professor of botany. She had lost so much blood as to excite attention by her altered appearance, and was brought from the country in quest of relief. I could not detect any hemorrhoidal disease, or any other recognized derangement; but observed that, when expulsive efforts were made, the blood issued from a small round orifice, apparently seated in a varicose vein. To this point I applied a ligature, with the effect of affording complete relief.

XVIII.

THE ACTUAL CAUTERY.

The extraordinary, and apparently almost magical, effect which, in certain forms of articular disease, is produced by the actual cautery, renders it one of the most valuable curative means employed in the practice of surgery. Yet little more than thirty years have elapsed since this powerful agent was first employed in Great Britain for the purpose of counter-irritation. I was then induced to adopt it by the recommendation of the late Professor Rust of Berlin in his work on "Arthro-kakologie," and have since taken every opportunity of inculcating the advantage derived from its employment. For many years these efforts produced little effect, and the proposal was even not seldom scouted as no less shocking to humanity than degrading to the profession. In illustration of the feeling at that time entertained on the subject, I may mention a circumstance which was lately recalled to my recollection by an old pupil, now occupying a distinguished position in the military service of her Majesty. A young man from the country, laboring under that unusual form of disease in the hip-joint which is amenable to the cautery, had had it applied with great relief to his sufferings; but after going home, in consequence of feeling some return of the symptoms, desired a repetition of the remedy, and applied for it in vain to all the neighboring practitioners, who replied to his request with an indignant refusal. At length, driven to despair, he resorted to the remarkable expedient of sitting down upon a red-hot poker.

Through the gradual influence of time, and the incontrovertible evidence of experience, this prejudice at length gave way, and allowed the cautery to get into fashion, which proved still more dangerous to

its character; for, being employed without due discrimination of cases, and too frequently with a reckless disregard of propriety in the mode of application, it was found to afford more disappointment than satisfaction, so that at present the ideas entertained on the subject are very uncertain and conflicting. It is therefore desirable that the morbid condition which is really suitable for the treatment in question should be distinctly understood.

Ulceration of the cartilages is a title that may be objectionable on the score of pathological accuracy, but, at all events, has the recommendation of having been long established and recognized as denoting a condition of articular disease characterized by very distinct features. These are—intense pain, aggravated by pressure or motion, and most severe during the night, not confined to the joint affected, and being generally also referred to the one beyond it, or a more distant part of the limb, which is weakened in its muscular power, disposed to œdematous effusion, and altered in its sensations, being usually hotter or colder than natural, and occasionally feeling as if benumbed. These symptoms may exist for weeks or months with little alteration except in regard to their degree of severity; but if the derangement from which they proceed be allowed to pursue its course without interruption, are almost sure, sooner or later, to terminate in anchylosis or suppuration, with caries of the bones affected. It is in this case that the actual cautery, if properly applied, before suppuration has taken place, may be regarded as very nearly, if not absolutely, a certain remedy.

It is not always easy to ascertain whether or no the patient still admits of relief, as the swelling, though seldom diffused, and in general limited to the immediate vicinity of the joint, usually possesses that soft semifluctuating condition which is apt to simulate the presence of a fluid. But wherever a careful examination leaves any room for doubt, it will of course be prudent to run the risk of erring on the safe side, and use the means that promise to be effectual, unless they have been too long delayed. The cautery should be heated to the utmost degree producible by a common fire, and be in size not less than a pigeon's egg, in order to retain its temperature sufficiently. In cases of emergency, I have not scrupled to use an Italian iron supplied by the laundress, or even a common poker. The eschar may in general be about two inches in length, and should be made on each of the two sides where the articulation is nearest the surface. The pain is much less than might be anticipated, and may be readily prevented through means of chloroform, which, for this purpose, need not be employed so as to produce its full effect, since the early stage of un-

consciousness will protect the patient from any unpleasant recollections of the procedure. A poultice should be applied until suppuration is established, and then some unctuous application, unless it is desired to check or stop the discharge, when the water-dressing may be substituted.

XIX.

ŒSOPHAGOTOMY.

Case I.

M. C., aged forty-five, was admitted into the hospital on the 22d of July, 1861. She stated that six days before the time of her application, while eating mutton broth, she had suddenly felt inability to swallow, together with severe pain, from which she concluded that a piece of bone had stuck in her throat. Under this impression she had applied for assistance, and been treated by the introduction of probangs or other instruments, without success, so that her distress remained unrelieved, and became complicated with fits of dyspnœa, which repeatedly threatened to prove fatal. On examination I found her in the state described, with a very anxious expression of countenance, and slight general fullness of the neck, which was not discolored or otherwise altered, but felt somewhat tender under pressure. Having introduced the long curved forceps without being able to touch the foreign body, but feeling satisfied, from the circumstances just mentioned, that there was one present; and fearing, that if allowed to remain it would cause suppuration, if indeed it had not already done so, I considered it necessary to adopt the only effectual mode of affording relief, by performing the operation of œsophagotomy.

With this view, having administered chloroform, I made an incision as if for ligature of the carotid artery, exposed the edges of the sterno-mastoid and sterno-thyroid muscles, and then opened the deep fascia of the neck, from under which a small quantity of purulent matter escaped. Introducing my finger through the narrow passage thus detected, I carried it upward and backward to the posterior part of the gullet, where a piece of bone was felt protruding from the canal. The requisite dilatation having been made, I guided in a pair of polypus forceps, and extracted a piece of mutton bone, extremely thin, but nearly an inch square.

The operation was performed on a Thursday, and on Friday the

patient seemed to be doing well; but on Sunday I was told that she had become delirious on Saturday, and appeared to be sinking. Upon visiting her I found the hands blue and perfectly cold, with the faintest possible thrill instead of a pulse, so that the case had certainly a most hopeless aspect. It occurred to me, however, that the symptoms might possibly proceed from hunger, as the patient, during a whole week, had not been able to swallow at all, and since the bone was removed had done so very imperfectly, from the milk and other fluids given to her escaping in great part by the wound; I therefore, by means of a catheter introduced from the mouth into the œsophagus, immediately injected some beef tea, with wine. In the course of half an hour there was, in all respects, a decided improvement, which, through a continued employment of the same means, repeated regularly at proper intervals, gradually increased until recovery was completed at the end of a fortnight.

Case II.

J. McG., aged twenty-six, from Aberfeldy, was admitted into the hospital on the 28th of August, 1855. He stated that on the 12th of the same month, while eating rabbit soup, he felt a piece of bone stick in his throat, and since then had been unable to swallow anything that was not fluid. The surgeon who was called to see him had administered an emetic, searched the pharynx, and passed a whalebone probang without affording any relief. Since then he had not been able to lie down, and had little sleep; his voice was husky and his breathing difficult; pulse 100, and the neck somewhat swelled.

Next day I dissected through the integuments and muscles, opened a deep-seated abscess, and extracted a portion of the rabbit's rib about an inch in length. The patient was immediately relieved from the severity of his sufferings, but remained in a state of considerable disorder for several days, though able to swallow fluids, of which a part escaped by the wound. At the end of a week he was convalescent, and before the close of another quite well.

Cutting through the coats of a sound œsophagus for the removal of some foreign body lying within it is an operation that can hardly ever be required, since, before it is warranted, there will almost necessarily have elapsed such a period of time as must allow ulceration and suppuration to be induced by the intruder, compressed as it cannot fail to be by the surrounding muscular fibers. Any hard substance so situated, therefore, should be regarded with much apprehension, since, especially if urged in a wrong direction by the use of probangs, it

must expose the patient to extreme danger, not merely from the effusion of matter behind the larynx, but from ulceration extending to the air-passages or blood-vessels. It is therefore of great consequence to prevent the risk of such consequences by timely removal of the foreign body when it is ascertained to be present.

The instruments in common use for this purpose, which are the probang and curved forceps, with blades opening in a vertical direction, may be regarded as worse than useless, since the foreign body, if arrested by its form, will not yield to the former instrument, while simple inspection of the latter will show that expansion of the blades must prevent the possibility of their seizing anything whatever. Instead of these dangerous and useless implements, every practitioner should be provided with long curved forceps, having blades opening laterally. By their means he may safely apply pressure to any substances that admit of being pushed downward, and will also be able to effect extraction if the case permits this. During my residence in London I was asked by two medical gentlemen to see a shopkeeper in St. Martin's Lane, who was in great distress from having swallowed an artificial tooth with its gold fastening, which had been arrested at the orifice of the œsophagus. I succeeded in removing it by the forceps, with immediate and complete relief. Upon another occasion the late Dr. Malcolm of Perth requested me to visit a lady resident in the neighborhood of that city, whose gullet was obstructed by a piece of food, and I used the same instrument, with the effect of affording instant relief, by pushing the soft substance downward by my effort to extract it.

XX.

THE EXCISION OF ENLARGED TONSILS.

The excision, or, more correctly, the curtailment of enlarged tonsils, affords the instructive lesson of an operation perfected in the first instance, and subsequently impaired through alterations in the mode of its performance, proposed by would-be improvers. All other means having failed to remove the swelling, it is the duty of the surgeon, says Celsus—"hamulo excipere et scalpello excidere." But, instead of following this simple and clear instruction, it appears that, until the latter part of last century, practitioners of surgery either abstained from interference with the disease, or attempted to subdue it by objectionable methods. Thus, we find Heister contriving complicated in-

struments for the purpose; Wiseman confessing that he had done much mischief by the use of caustics and cauteries; and Sharpe still more unfortunate through means of the ligature.

It is just a hundred years since M. Caquet of Rheims showed, by ample experience, that the more closely the directions of Celsus were followed the better it would be for the patient; while his colleague, M. Museux, taking the same view, invented, for this particular purpose, the forceps which still bear his name, having each of their blades terminating in a double hook. With this instrument, or a simple hook and curved bistoury, M. Caquet operated so frequently and successfully as to establish the operation in such confidence as might have been expected to prove general and lasting. In this country, however, it does not appear to have been recognized at all; and, so lately as 1812, we find Mr. Chevalier, in the Med. Chirurg. Transactions of London, describing a plan for facilitating the employment of ligatures as the only practicable means for the removal of redundant tonsils.

While house-surgeon of the Royal Infirmary, I had under my charge a young woman who had been admitted on another account, but also suffered from an enlarged tonsil. Being anxious to relieve her, and seeing strong objections to both cauteries and ligatures, I resolved to cut away the tumor, which was done with perfect facility and success. Supposing that this was a novel procedure, I felt not a little surprised, on going to Paris soon afterward, to find that the late M. Lisfranc taught excision of the tonsils as a regular part of his operative surgical course, and precisely as M. Caquet had performed it. On my return I gave the forceps of Museux to Mr. Liston, and he immediately began to operate upon all the cases requiring this treatment that came in his way, which were neither few nor rare, since the disease is very frequent in Scotland, especially the districts of Perthshire and Stirlingshire. The operation thus became established in Edinburgh, whence it must have been carried across the Tweed by many of the Englishmen who pursued their studies here, but does not appear to have found much favor in London, until, at a comparatively recent period, it all at once came into fashion as a remedy for deafness, of which it is occasionally, but very seldom the cause.

Since the operation thus became generally adopted, it appears that the simple and efficient means originally employed for its performance have been supplanted by others in every respect inferior, such as scissors and guillotines. Of these, the former are very objectionable on account of their inability to execute the section with certainty at one stroke, while it is difficult, or almost impossible to obtain an opportunity for a second, from the blood trickling into the pharynx and caus-

ing the patient to cough. But the latter instrument is still more to be deprecated, since, besides being so difficult to manage in such a narrow inaccessible space as to render its performance in most cases little better than a sham or pretense, it is also dangerous, for instead of drawing the tonsil inward, and away from the carotid artery, so as to make its excision perfectly safe, as is done by the hook or forceps, it presses the gland outward and closer to the vessel. It is, therefore, with no surprise that I have heard of a fatal hemorrhage from this source.

Fearing that, through the influence of these faulty means, a most useful operation may again fall into discredit, I beg to enter my protest against any deviation from the old rule of "hamulo excipere et scalpello excidere." The best knife for this purpose is a probe-pointed curved bistoury, which being applied with its convex or blunt edge upward, and urged with a sawing motion of its blade downward, easily and safely accomplishes the object in view.

XXI.

UNION BY THE FIRST INTENTION.

In the year 1826 I published a paper on the treatment of incised wounds, with the view of showing that the method then employed in their treatment was much opposed to primary union. At that time the practice was to close the wound immediately after its infliction by straps of adhesive plaster, then to apply a pledget of ointment, and lastly to envelop the part concerned with a long bandage, which was not undone until the fourth day, in order that what was called the adhesive inflammation might subside before the first dressing. The imperfections of such a process will appear at once, when the steps by which the adhesion of cut surfaces is accomplished are taken into account.

John Hunter erroneously supposed that blood became organized so as to constitute the bond of union; while in more recent times Mr. Paget has fallen into a mistake no less serious by denying that there is any uniting medium at all required. The truth is, that after the bleeding has ceased, a discharge of serum and lymph or organizable matter takes place from the cut surfaces, which are then glued together, if sufficiently approximated and retained in contact. This process,

instead of requiring to be preceded by inflammation, is certainly subverted by it, so that heat, redness, and pain may be regarded as evidence that adhesion will not be the result. But the old system of dressing by complete closure of the wound immediately after its infliction prevented the discharge of both blood and serum, and thus allowed these fluids to accumulate so as to distend the cavity, and separate its surfaces beyond the limits of adhesion, whence inflammation was necessarily excited as the precursor of suppuration and granulation.

From what has been said, it must be obvious that the bleeding vessels of wounds which are desired to heal by the first intention should be carefully secured, not merely for the prevention of injurious hemorrhage, but also to oppose the accumulation of blood in the cavity. The ligatures employed for this purpose afford the farther advantage of establishing a communication between the bottom and mouth of the wound, so as thus to provide a drain for the discharge of both sanguineous and serous effusion. It has been alleged on theoretical grounds that the threads employed for this purpose must cause irritation and otherwise impede the adhesive process; but any such apprehension is shown to be groundless by the results of daily experience; and it cannot be denied that the obstacle so afforded is of infinitely less consequence than the presence of blood or other fluid, which has the effect of separating the raw surfaces. "Torsion" and less efficient means, such as thrusting needles through the textures, may be employed to close the bleeding vessels, but cannot prevent the oozing that still continues in a wound of any considerable size, so that while the orifice heals the cavity is almost sure to become an abscess.

But notwithstanding the protection against deep-seated accumulation of blood which is derived from the ligatures, the old plan of closing the wound immediately after its infliction was almost sure to defeat the object in view; and accordingly, within my recollection, it was no uncommon remark of students that during the whole period of their hospital attendance they had never witnessed an instance of union by the first intention, except in wounds of the lip or cheek, where, there being both an external and an internal orifice, the edges of the former could be kept in contact without causing any retention of blood between the surfaces required to adhere. Whenever the wound possesses this condition, as when it opens into the mouth, the abdomen, a joint, the bladder, the vagina, or the rectum, the edges may be retained in accurate contact. But when, as more generally happens, there is only one orifice leading to a cavity in the subcutaneous texture, means must be employed to prevent the retention of blood or serum. At one time I thought that the best way of doing this was to keep the wound open

for several hours before adjusting its edges; and I still believe that the object in view would be thus most certainly accomplished, if the process could be performed without a renewal of the bleeding. On the whole, however, I feel satisfied that a better method of proceeding is to employ sutures at moderate intervals, to place some permeable material on the orifice, and to apply pressure over the cavity. For the two last-mentioned purposes there is nothing better than a sponge of adequate size, and for the first one the silver wire introduced into practice with so much advantage by Dr. Sims of New York is greatly preferable to the silk threads previously employed. This improvement —for which, together with the great boon of Ætherization or anæsthetic respiration, we are indebted to our transatlantic brethren—has rendered the operation for vesico-vaginal fistula and similar derangements practicable, with a prospect of success that affords an agreeable contrast to the former hopelessness of such undertakings.

XXII.

HYDROCELE.

Case I.—Simple Hydrocele.

A. C., aged sixty-one, was admitted into the hospital on account of a large hydrocele in the right tunica vaginalis, of two years' standing. It was immediately evacuated, and injected with tincture of iodine (℥ij Ed. Pharm.), which was allowed to remain, after being diffused over the whole surface by a rough shake of the scrotum. On the third day the subsequent swelling was at its height, on the fourth day it was diminishing. On the seventh day the patient was dismissed cured.

This case is selected, not from being of an exceptional character, but because it affords an example of the result which usually, or, as I should rather say, invariably attends the operation employed. In former times candidates for graduation at this University used frequently to choose hydrocele as the subject of a thesis, from the variety of opinions entertained in regard to its treatment, and the different procedures employed for this purpose affording convenient materials for discussion. Thus, it was said that port wine, when injected, was apt to fail, and also to produce very serious consequences if it happened to enter the cellular texture of the scrotum—the operations of incision and excision were bloody and painful—the seton was no less

tedious than irksome—and so on. But since the use of iodine has been introduced, the theses on hydrocele have gradually become fewer, until they entirely disappeared ; whence I concluded, that the advantages of this means were so manifest that they had led to the abandonment of all the others, and left no room for discussion. I was therefore accustomed to quote this unanimity of practice as an illustration of what might happen, if through time and careful observation all surgical derangements should come to be treated in accordance with the principles which judgment and experience had decided to be best for each. But the hopelessness of any such aspirations for the perfectibility of surgery has been lately well shown by a strenuous attempt to substitute for the treatment by injection with iodine the old and justly abandoned procedure of seton, which it was proposed should consist of silver wires instead of the silk threads formerly employed. It is difficult to imagine that such an absurdity could be adopted by any surgeon of ordinary intelligence, and yet if the medical journals can be regarded as affording indications of professional opinion, it might for some time have appeared that a real improvement had been introduced, instead of a proposal implying the most lamentable lack of practical principle.

The injection of iodine, in order to be effectual, must be performed with attention to the following circumstances : In the first place, the patient should stand while the sac is tapped, in order to let the water be drained off completely. Then ʒij of the Edinburgh tincture of iodine, which is much stronger than that of the London Pharmacopœia, should be injected, unless the tumor is either very large or very small, when there may be a corresponding increase or diminution of the quantity employed. And lastly, a rough shake of the scrotum should diffuse the injected fluid over the whole surface of the cavity. The pain which ensues is generally slight and transient, hardly requiring any confinement; and at the end of two or three days, the swelling having attained its height, begins to subside, so that it speedily disappears.

Unless the points which have been mentioned be duly observed, the procedure may prove abortive, without justly forfeiting confidence, as will appear from the following case: Not long ago a gentleman applied to me on account of a hydrocele, which he said had been injected more than once with port wine unsuccessfully. I told him very positively that iodine would prove effectual, and soon afterward received a letter from his residence in London, advising me to express myself with less confidence, as his surgeon, without any better success, had injected a compound mixture of iodine and other matters, which, after

being retained a few minutes, was allowed to escape. I replied, that under the circumstances stated, I was not surprised at the failure. Then there came another letter from the patient, desiring to know the particulars which I deemed essential for success. I sent the directions above given, and before long was informed that the operation performed in accordance with them had proved completely successful.

It may be remarked, that this operation is applicable to all the forms of hydrocele, whether it be the ordinary one of water in the tunica vaginalis, or a collection of fluid in the spermatic cord, or that peculiar condition named Spermatocele, which has been commonly regarded as not amenable to injection.

Case II.—Hydrocele and Spermatocele.

J. D., aged forty-nine, was admitted on the 27th of May, 1861. Ten years ago he had had a hydrocele on the left side tapped and injected, but not effectually, as within the last two years fluid had again accumulated at the same part. Three years ago I had tapped and injected a hydrocele of the right side, which remained free from disease.

On more particular examination of the left side it appeared that there were two swellings, one being a distention of the tunica vaginalis, and the other a round circumscribed tumor attached to the upper part of the testicle. The latter was readily recognized as a spermatocele, and found to be so when tapped; but was injected with iodine at the same time as the other, and with equal success, so that the patient was dismissed cured on the 10th of June.

Case III.—Triple Spermatocele.

T. N., aged fifty-three, from Leadhills, recommended by Dr. Martin, was admitted on the 10th of April, 1861, with a great enlargement of the scrotum, which on examination was found to depend upon three distinctly different collections of fluid, two being seated on the left and one on the right side. The patient stated that the swelling on the left side was of about two years' standing, and had slowly increased without giving him much trouble, except by its bulk, while the other had commenced about a year ago, and enlarged more rapidly. It had been tapped about five weeks before the date of admission, but not injected.

Not anticipating anything unusual, I proceeded to operate upon this case, and on tapping one of the collections was surprised to find that its contents presented the peculiar colorless-pellucid fluid indic-

ative of the spermatozoa, which were accordingly detected in abundance by the microscope. Still more to my surprise, the other two swellings were found to possess the same constitution. All the three were injected at the same time, and with such success that the patient went home on the 24th.

XXIII.

ABDOMINAL HYDROCELE.

On the 3d of June last, a child between four and five years of age, the son of a farmer in Berwickshire, was brought to me from the country, a distance of about fifty miles, laboring under what seemed to be an incarcerated, if not strangulated, inguinal hernia. It appeared that a rupture-bandage had been worn between two and three years, but that the scrotal swelling suddenly enlarged, with great distention of the abdomen, so as to present a very alarming appearance; although, with the exception of some tendency to constipation, there were no corresponding symptoms of any consequence.

At my clinical lecture I introduced this child, with the intention of dividing the tendinous ring at the lower end of the inguinal canal, in order to prevent the risk of injurious pressure; but after chloroform had been administered, and the muscles were relaxed, I remarked that the abdominal swelling, though very large and tense, like a uterus at the full period of gestation, extending high above the umbilicus and to a proportionate extent on each side of the cavity, still left a narrow space, in which the intestines seemed to possess their natural laxity. Upon this ground, coupled with the absence of symptoms denoting strangulation, I at once formed and expressed the opinion that the case was not hernia but hydrocele.

Lest this view, however, should not be correct, instead of puncturing the scrotal swelling by means of a trocar, I made a small incision through various layers of thickened texture, which showed that the fluid was contained, not in the tunica vaginalis, but in an expansion of the cord; and evacuated a large quantity of serous effusion. Then introducing my finger, I found that the state of matters was what had been suspected, although the abdominal part of the swelling remained unchanged. I accounted for this by attributing it to the effect of pressure by the bandage, and proposed, after awhile, to puncture through the parietes of the abdomen. But, in the course of two or

three days, the fluid began to drain away from the scrotal aperture, at first clear, and then slightly turbid with lymph—the child at the same time being slightly feverish—while the tumor gradually diminished. On the 24th of June he returned home, where, as I have learnt from his medical attendant, he was soon running about quite well.

XXIV.

HYDROCELE AND HÆMATOCELE OF THE NECK.

Collections of serous and also of dark coffee-colored fluid are not unfrequently met with in the neck and neighboring parts of the chest, where they have received the same designations as those given to accumulations of a similar kind in the tunica vaginalis. Such tumors are sometimes connected with the thyroid gland, but may exist quite independently of it, and require the same treatment as the morbid conditions from which they have received their respective titles. The iodine injection may be regarded as certainly effectual when the fluid is serous, and even when it has the bloody character this means should be tried before having recourse to the more severe measure of incision. In this case it may be necessary, however, to repeat the injection, in order to complete obliteration of the cavity.

Case I.

A. M'E., nine years of age, was admitted on the 7th of November, 1860, on account of a tumor, about the size of a small hen's egg, lying over the posterior edge of the sterno-mastoid muscle. It was very tense, but distinctly fluctuating, and was said to have been noticed soon after birth, since which time it had gradually increased—of late more rapidly—and also become painful. Next day I introduced a trocar and drew off somewhat less than two ounces of dark-colored fluid like that of a hæmatocele, and injected two drachms of the tincture of iodine. Four days later, as a portion of the tumor had not been evacuated on the former occasion, I again introduced the trocar and drew off some straw-colored fluid similar to that of an ordinary hydrocele, and then repeated the injection. On the 18th the patient was dismissed, and on the 29th he returned to show that he was quite well.

It thus appears that there was a double cyst, presenting the curious combination of hæmatocele and hydrocele.

Case II.

G. V., eleven years of age, from St. Andrews, recommended by Dr. Adamson, was admitted on the 16th of April, 1861, for the remedy of a tumor the size of an orange, at the lower part of his neck on the right side. It had first attracted notice when he was about a year old, and remained so small as to excite little apprehension, until three years ago, when it began to enlarge, and has continued to increase ever since.

The skin was not discolored or adherent, and the swelling was so lax that it seemed to vanish under pressure, whence some of the medical men who had examined it supposed that the contents communicated with the vascular system. For my own part I felt persuaded that the tumor was merely a cyst, and punctured it accordingly, with the effect of discharging a dark bloody-looking fluid, which did not deter me from proceeding with the injection. This was followed by a considerable diminution, but not complete obliteration of the cavity, and therefore was repeated on the 9th of May. On the 1st of June the patient was dismissed cured.

XXV.

THE USE OF BLISTERS IN THE TREATMENT OF ULCERS.

In order to understand the proper treatment of an ulcer, it is necessary to know the process by which it is healed, and also the obstacles by which this result is apt to be opposed. Any one who, in conformity with common language, talks of a sore being "filled up," or supposes that the granulations are formed in successive layers, to supply losses of substance, is plainly not in a condition to entertain sound ideas on these subjects, and should lose no time in reading the essays of Fabre and Louis, in the Memoirs of the French Academy of Surgery. He will there find it explained that the appearance of filling up is a deception similar to that which makes bodies at rest appear to be moving when surveyed by those who are not conscious of their own motion—and that when the surface of a sore comes to be on a level with the surrounding skin, it is from the latter descending, not from the former ascending. So long ago as when house-surgeon of the Royal Infirmary, I ascertained these facts for myself by the dissection of granulating

sores after death; and I was afterward glad to find the truth fully established in the writings to which reference has just been made. Since then I have constantly endeavored to inculcate the correct explanation of granulating action; and it is therefore with no less surprise than regret that I see systematic works compiled for the use of students still maintaining the old views in regard to the growth of granulations.

The granulating action produces merely a thin pellicle or temporary skin, under which, instead of effusion or the formation of new substance, there is carried on a process of absorption that draws the surrounding textures together, and thus, in proportion to their laxity, lessens the size of the resulting cicatrix. Instead, therefore, of using applications with a view to promote the formation of new tissues, or what the old surgeons called "carnifying" means, it is evident that the aim of remedial treatment should be directed toward the encouragement of contraction, and the removal, so far as possible, of whatever obstacles may stand in its way.

One of the best illustrations for this purpose is afforded by the callous or indolent ulcers to which the inferior extremities of the laboring classes are so peculiarly liable. There is here the appearance of a deep excavation, with firm round edges, in consequence of the subcutaneous cellular texture being greatly thickened and indurated into a brawny consistence, through the effect of long-continued irritation. So long as this condition exists, no application can induce the healing process, while simply restoring the limb to its natural size renders any other means of treatment unnecessary. It was formerly supposed that the best way of accomplishing this object consisted in effecting pressure by the employment of plasters and bandages; but more than thirty years ago, I showed that a much easier, and also more efficient mode of procedure was to apply a large blister over the thickened part of the leg, as it speedily dispersed the swelling, and thus allowed the granulating action to proceed without any further interference, until cicatrization was completed. The saving of expense and trouble obtained by this mode of treatment might have been expected to insure its ready and general adoption; but, with the exception of gentlemen educated in Edinburgh, I believe there are still few members of the profession even aware of its proposal. Indeed, the systematic books either entirely ignore it, or mention some feeble objection that shows the want of any practical experience. Some of them advise the blister to be no larger than the sore, and others express a great dread of erysipelas—of which, in the whole course of my practice, I never met with a single case so produced.

Case I.

T. N., aged fifty-one, quarryman, was admitted on the 1st of March, 1861, on account of two ulcers of the leg which had existed eleven years. One was the size of the palm of the hand, the other smaller. The surface of both was much depressed, the edges being round and hard, and the limb much swelled. On the 5th a blister was applied over the whole thickened part of the leg. On the 11th the surface of the sores was nearly on a level with the surrounding skin. On the 28th the ulcers were almost entirely healed. On the 12th of April the patient was dismissed cured.

Another obstacle to the healing of ulcers is the existence of some peculiar action which prevents the restorative process from producing its proper effect. There can be no better example of this than that afforded by persons whose constitutions have been injured by the use of mercury, and who so frequently suffer from sores, either superficial and confined to the integuments, or deep-seated and affecting the periosteum or bones. In both cases the condition concerned is distinguished by characters which a practiced eye readily recognizes, and proves very obstinate under ordinary treatment.

It was formerly supposed that very severe measures were requisite for the counteraction of this morbid state; and I can recollect when the wards of an hospital resounded with the shrieks of patients having caustic potass applied to their sores, while glowing chauffers, bristling with red-hot irons, were carried into the operating theater for cauterizing ulcerated shin-bones. But many years have elapsed since the efficiency of milder means has been established through the use of iodine and blisters. Small doses of the iodide of potassium, such as two grains given three times a day in simple solution, seem productive of all the benefit to be derived from the former of these sources, while larger doses are not free from the suspicion of doing harm. I have said the solution should be simple—that is, in water merely—because it has long been my firm conviction that the sarsaparilla so generally administered upon such occasions is utterly inert and useless. In private practice its employment may not be objectionable, if the patient can afford to pay for it; but hospitals should be protected from a useless expense which in some of them annually exceeds many hundred pounds, and exerts the misleading influence that necessarily results from combining inefficient with efficient means in the treatment of disease. In regard to the blisters, it may be remarked that when em-

ployed for the case under consideration, being required to act merely on the ulcerated surface, they should not extend much beyond it.

That this most simple and powerful mode of treatment has not yet been generally adopted, would appear from cases frequently coming to my knowledge, such as the two following, which have lately done so. In one of these the patient was adjutant of a cavalry regiment in India, who came home for the express purpose of suffering a complete or partial amputation of the foot. I found it enormously swelled and deformed, with apertures that allowed the probe to pass not only down to the bone but into its substance. Under the treatment just explained, all the morbid characters quickly disappeared, and the patient has gone back to resume service. The other case was that of the principal engineer in one of the Peninsular and Oriental Company's steamships, who suffered from a most formidable enlargement at the upper part of his leg, apparently involving the knee-joint, and allowing a probe to pass through several openings deep into the substance of the tibia. In the Mauritius and elsewhere the patient had been assured that amputation through the thigh would be requisite for his relief, and he expressed his perfect readiness to permit whatever seemed to me necessary. Under the same simple treatment he progressively improved; and is now in perfect health, making arrangements for resuming his situation.

Case II.

C. H., aged twenty-five, seaman, from Dundee, was admitted into the hospital on the 27th of March, with a large ulcer over the olecranon, exposing diseased bone to the extent of more than a half crown in surface, and apparently of considerable thickness. He was extremely weak and emaciated, in consequence of having been dosed with mercury about eighteen months before on a voyage to India. Repeated blisters were applied, together with gr. ij of Iod. Potas., taken three times a day in simple solution. Under this treatment the patient quickly improved; some dead portions of bone separated, and he was dismissed cured on the 22d of May.

XXVI.

POLYPUS OF THE NOSE.

There are few subjects of surgical practice which have been so much misunderstood and improperly treated as those named simple or mucous, malignant, and fibrous polypus of the nose. In discriminating these very different morbid conditions it is necessary to recollect that the first mentioned is merely an expansion of the lining membrane, where it covers the superior spongy bone, never growing from the septum, floor, or external side of the cavity; generally existing gregariously in both of the nostrils; and not possessing such force of increase as to produce either absorption or displacement of the osseous walls surrounding it. That the second is a morbid growth, proceeding from the bones of the face, or base of the skull, occupying either one or both nostrils, and having no limit to its enlargement, which may not only expand the cavity, but displace the eyeballs and alter the features. Lastly, that the third is attached to the surface of the bone by a single root, generally near the margin of the posterior nostril, whence it is apt to descend into the pharynx, so as to constitute a tumor that may be seen or felt behind the soft palate, and more rarely makes its way into the maxillary antrum, or through the bones of the face, so as to project under the cheek.

In regard to the treatment, it is obvious that the malignant polypus should be considered as beyond the reach of interference, since not admitting of extirpation from the situation of its roots, it must render any operation not only useless but injurious, by giving an impulse to the morbid disposition.

The simple or mucous polypus used to be considered a hardly more favorable subject of treatment, from its tendency to relapse after extraction, in consequence of the operation being improperly performed. To understand this, it is only necessary to look at the instruments formerly employed for the purpose. They were forceps of a large size, so fashioned, with windows in their blades, as to seize the body of the polypus, and nibble it away at successive "sittings," as they were called; or still worse, crooked knives, scissors, and loops of wire, which could not possibly accomplish the object in view effectually. Instead of these faulty means, slightly curved forceps, of the smallest size consistent with adequate strength, should be gently insinuated along the base, or by the side of the superior spongy bone, with the blades expanded so far as the cavity permits, until, when closed, they

are found to embrace the root of the growth; then, by a steady combination of twisting in one direction and pulling, the portion of substance comprehended between the blades is detached from its connection, when the polypus either follows or is so loosened that it falls into the pharynx, if not blown through the nostril. By repeating this procedure, if necessary, the nose is thoroughly cleared, and unless there should be some unusually strong tendency to reproduction, the patient will experience no further trouble.

Case I.

W. H., eighty-four years of age, was admitted on the 13th of March, 1861, having both of his nostrils completely obstructed by what seemed to be the simple mucous polypus. Next day I cleared the cavity completely, and on the 19th the patient was dismissed, greatly pleased with his improved condition.

Case II.

T. L., five years of age, applied at the hospital on the 2d of May, 1861, with both of the nostrils completely obstructed by the simple mucous polypus. By employing the forceps in the way that has been described, the cavity was immediately cleared.

The distinctive characters of the fibrous polypus were first pointed out by Dupuytren, who supposed that it was the early stage of a malignant or fungating tumor. But this opinion was certainly erroneous, since there is no transition, or any other connecting circumstance ever observed, between the two sorts of growth in question. The fibrous polypus is distinguished by the firmness of its texture, which frequently almost approaches that of ligament, and by its disposition to bleed, which either appears spontaneously, or is induced by attempts to effect extraction. It may be added that there is also not unfrequently a constant discharge of watery fluid, and that respiration is usually obstructed completely in both nostrils, although the growth is confined to one of them.

Having had occasion to operate upon many remarkable cases of this kind, I feel warranted to state that Dupuytren's plan of fixing a succession of hooked forceps into the body of the tumor is not the best way of effecting extraction, since it requires an enormous amount of force, as was shown in one of his two recorded cases, which I had an opportunity of witnessing, where the surgeon and two strong assistants had to unite all their strength for the accomplishment of evulsion.

Instead of this procedure, I have found it much better to use the ordinary forceps employed for the removal of simple or mucous polypus, assisting their action by the fore and middle fingers of the left hand, introduced behind the soft palate, and to aim at the point of attachment, which seldom exceeds a small extent. In this way, by a few determined efforts, I have generally been able very speedily to overcome the difficulty. The bleeding, which is profuse, and to an unpracticed eye very alarming, generally ceases immediately after the tumor has been removed; but, if it should continue, may be easily arrested by plugging the posterior nostrils.

Case III.

T. N., fifteen years of age, from Dumfries, was admitted on the 7th of March, 1861. It was stated that about two years before this time he had begun to suffer, almost daily, a profuse bleeding from the nose, and also experienced difficulty of breathing, especially through the left nostril. Various remedies having been tried without any good effect, a polypus was at length detected, but not considered remediable. More lately, an attempt had been made to extract it without success, and the symptoms becoming more aggravated, the patient was sent to me.

On examination I found a fibrous growth completely blocking up the nostril, and projecting backward into the pharynx—the boy, from long-continued hemorrhage, being extremely emaciated and quite anæmic. I therefore lost no time in performing the operation as it has been described, by making the fore and middle fingers of the left hand, placed behind the soft palate, co-operate with the small forceps introduced through the nostril. In this way the tumor was easily removed, though not without considerable bleeding, which, however, was the last sustained by the patient, who left the hospital on the 15th, and is reported to have soon afterward completely regained his health.

Case IV.

M. M'L., twenty years of age, from Ross-shire, was admitted on the 23d of May, 1853. He stated that until the last two years his health had been perfectly good, but that, during this period, he had suffered from frequent and excessive bleeding at the nose, accompanied by a gradually increasing swelling of the right cheek, and obstruction of breathing, at first through the right nostril, and then through the left also, until both were completely obstructed. After suffering in this way

about twelve months, he had repaired to the Infirmary at Glasgow, where his case appears to have been regarded as irremediable, since, although he had while there a very copious discharge of blood, no attempt was made to afford relief. He therefore returned home; and, as the hemorrhage became not only more frequent, but more severe, his state seemed entirely hopeless. But cherishing some idea of escape, the patient gathered together a little money for the purpose of coming to Edinburgh, which was regarded by his friends as so useless an undertaking that they seized upon his little store as the best means of preventing its execution. He, however, obtained the requisite means from some other source, and having accomplished the long journey, placed himself under my care.

I at once recognized the fibrous polypus of Dupuytren, to the one of whose two recorded cases, which I happened to witness, this patient's had a remarkable resemblance. The tumor was about the size of a small orange, firm, elastic, and slightly lobulated, not adherent either to the integuments or the mucous membrane, and evidently proceeding from the maxillary antrum through absorption of the bone. In order to get access to it, and also to afford the blood that must flow free vent for its escape, I laid open the cheek from the angle of the mouth backward, so as to expose the tumor completely. Strong forceps were then fixed into it and used with all my force; while the fingers of the left hand assisted in detaching the roots. By these efforts, though not without time, labor, and fearful hemorrhage, the object was at length attained. The wound of the cheek healed entirely by the first intention, so that it left no trace of its existence; and the patient, completely relieved from the disease, soon regained his health. He was dismissed on the 20th of June.

Case V.

Eleven years ago, Lord —— called upon me and presented the following letter:

New Street, 25th June, 1850.

Dear Sir:—I beg leave to inform you that Sir Benjamin Brodie and myself, in the first instance, and Mr. Travers, Mr. Cæsar Hawkins, and myself, in a second consultation, made a strict investigation of Lord ——'s case, and that we all came to the conclusion that no attempt at the removal of the disease (about which you are consulted) could, with any propriety, be recommended, *firstly*, on account of the extent of its attachment; *secondly*, on the impossibility of its complete extirpation; and *thirdly*, on the great probability of its return.

My intention in writing this, however, is only to express to you the opinion formed here, and not in any way to dictate to you; but I considered it due to any surgeon to inform him of the investigation which has been made, and the conclusion which had been arrived at from the examination.

Believe me, etc.,

BRANSBY B. COOPER.

P.S.—I wish you to see the prescription for the medicine I have recommended; and should be obliged for your opinion on the case.

Lord —— then stated that he had returned from Canada, where he was upon the staff of Lord Elgin, to obtain relief from his complaint, and had been two months in London under the care of Mr. Cooper, together with the other gentlemen mentioned in his letter. As they all led him to understand that his case was hopeless, he was prepared to submit; but as a forlorn hope, wished to have my opinion on the subject. He then informed me that for a long while past he had been annoyed by impeded breathing through his nose, and a constant discharge of watery fluid from it, which was particularly inconvenient at night by soiling his pillow during sleep; but that within the last twelve months the complaint had assumed a more serious aspect by the accompaniment of frequent and excessive hemorrhage. Upon examination I found the nostrils very narrow, and presenting nothing to view on the most careful inspection; but in the pharynx I felt a round tumor protruding from the left posterior opening of the nasal cavity, which completely accounted for all the symptoms. The patient told me that this growth had been detected in London, where it was proposed to attempt its removal by dividing the soft palate; but that this proposal had been rejected as no less impracticable than useless.

Rather surprised that any difficulty should have been experienced in the case, I at once expressed my readiness to remove the polypus by extraction through the nose; but this proposal was too startling for immediate acceptance, and I was therefore requested to communicate with Mr. Cooper, while the relatives were acquainted with the opinion that I had expressed.

In the course of a few days, during which one of the profuse bleedings took place, the requisite sanction having been obtained, I was requested to do whatever seemed proper; and therefore, with the assistance of Dr. Duncan, which I had asked in anticipation of hemorrhage, proceeded without delay to the operation. I used the ordi-

nary small polypus forceps, and by a single twist of them brought away the whole of the morbid growth through the nose without any bleeding worthy of mention.

Thus a disease regarded as incurable was instantly removed; the respiration became free; there was no more hemorrhage; and the general health soon became restored; so that the patient was able before long to return to Canada, where he resumed his military duties. He afterward went to India and commanded one of her Majesty's regiments during the mutiny campaign, never having experienced the slightest tendency to relapse, or any inconvenience except the loss of his olfactory sense, which was not regained.

XXVII.

AXILLARY ANEURISM.

The Hunterian operation was so greatly and manifestly superior for the treatment of popliteal aneurism, to the one previously in use, that it speedily banished the latter from professional confidence, and came to be regarded as the proper course upon all occasions admitting of its adoption. But there appears to be good ground for suspecting that this generalization was no less unjust than hasty, since, while the popliteal vessels were situated very unfavorably for the old operation, and the femoral artery lay most conveniently for the new one, there were other parts of the body in which, the conditions being reversed, there was not the same reason for preference. In the popliteal region the vein lies over the artery, with which it is inclosed in a firm sheath so as to render ligature of the latter almost impracticable without injury of the former, which would cause mortification of the limb as a necessary consequence of both vascular trunks being obstructed; while, on the other hand, the femoral artery is more superficial than the vein, and easily accessible for ligature. But, in regard to axillary aneurism, the state of matters is precisely the opposite, since the artery is readily within reach at the seat of disease, and exposed with great difficulty at any part of its course nearer the heart. Thus it will be found that almost all the earlier operations performed on the Hunterian principle for axillary aneurism were mortifying failures, and that it has been only since Mr. Ramsden led the way to ligature of the subclavian at the best place for the purpose, that this mode of treatment has proved at all satisfactory. Even in this improved, or,

as it has been thought, perfect state, the operation will be found to have been abundantly fruitful of fatal results, as appears from the researches of Mr. Erichsen, whom all the cases that he could find on record have led to the conclusion that 50 per cent. perish from the various effects of hemorrhage, inflammation, and deep-seated suppuration—the true average being obviously much more unfavorable, as the successful are less likely to escape notice than the unsuccessful cases. For my own part, I have tied the subclavian artery in three cases, two of which terminated well, and the third proved fatal from hemorrhage —the patient's arterial system being in a very unsound state, as indeed appeared from his having had the femoral artery tied by myself on a former occasion for popliteal aneurism. I have therefore no prejudice or hostile feeling toward the operation, but must admit that, except in certain conditions of the neck, it is a very difficult and troublesome process, especially on the left side, where the vessel lies lower than in the right.

It may be said, that the dangers of tying the subclavian, however great, must fall short of those to be expected from opening the sac, and securing the vessel at the seat of its rupture, such as the profuse hemorrhage to be anticipated at the time of performance—the exhausting suppuration of the large cavity exposed—and the risk of secondary bleeding from applying the ligature at an unsound part of the vessel. These seem indeed, at first sight, rather formidable objections to the procedure in question; but, when dispassionately considered, will be found to lose much, if not all of their force. For, in the first place, it has been established that the operation may be so conducted as to confine the loss of blood within a very moderate amount; then the cavity, if freed from indurated coagulum, is found to contract and close with great facility; and lastly, the alleged inability of the vessel to be tied with safety at the ruptured part appears to be purely matter of assumption, which is completely contradicted by experience.

In spontaneous aneurism it has been an established principle that all the portion of artery included within the sac is to be deemed unsound, and unworthy of confidence as a subject for the ligature. But this view appears to have been rashly adopted, since extension of the sac does not depend upon the state of the vessel, or in any way affects it, and as the disease, notwithstanding its title of spontaneous, to distinguish it from the traumatic form, in 99 cases of 100, or rather perhaps always, proceeds from some local injury stretching or bruising the coats at a particular point of their extent. It may be further remarked, that although in an aneurism of any given size the artery beyond its limits is deemed to be sound, it would be considered dis-

eased at the same part if the tumor had thus far extended its limits; while it is obvious that this change could not have produced any alteration in the state of the vessel. It was these considerations which guided me safely through the following very formidable case.

A gentleman, about fifty years of age, resident in Glasgow, applied to me on account of an axillary aneurism of large size, and having been advised to have the subclavian artery tied, went home to make the necessary arrangements. Upon his return to Edinburgh I found the arm greatly swelled from the shoulder downward, of a bright-red color, and extremely painful, in which state it continued with aggravation of the symptoms notwithstanding all the soothing means that could be employed. In the course of two or three days the redness assumed a dusky hue, and vesication appeared at various parts of the surface, there being at the same time extreme frequency of pulse, with other indications of intense constitutional disturbance. In these circumstances it was manifest that the result must soon prove fatal, unless some effectual means of relief were speedily employed. Of these the only one that seemed practicable was amputation at the shoulder-joint, which of course would instantly terminate the patient's existence, unless the ruptured artery admitted of being tied. But for the reasons which have been stated, entertaining no doubt on this point, I did not hesitate to perform the operation, cutting through a mass of gangrenous muscles, and exposing the artery a little below the clavicle, where the coats at its orifice, seeming quite sound, the ligature was applied. Everything went on favorably afterward, so that in less than three weeks the patient felt able to go home, where he enjoyed good health for several years, until carried off by a different disease. Fortified by this experience, I was prepared for the following still more arduous undertaking.

Case I.

D. L., aged forty-seven, applied for admission into the hospital on the 26th of January, 1860, on account of a large tumor, which completely filled the left axilla, and greatly distended the muscles before as well as behind the shoulder. The skin was tense, but not at all discolored, and an obscure fluctuation could be perceived throughout the whole extent of the swelling, which the patient positively stated had not existed more than a week, although for nearly two months he had felt pain in his shoulder, and observed that there was no pulse at the wrist. There was a distinct aneurismal bruit, but no pulsation that could be felt in the tumor, except at its upper part, which pro-

jected above the clavicle. As in these circumstances there could be no hesitation in regarding the disease as an aneurism, careful inquiry was made as to the probable cause of its origin, but at first without success, since the patient positively denied having experienced any blow or wrench adequate to produce the effect. At length, however, he stated that, being tenant of a saw-mill, he occasionally assisted his men in turning heavy logs by means of the "cant-hook," and that upon such occasions—having had his left hand amputated at the wrist-joint by myself twelve years ago, on account of an injury from a saw—he was accustomed to rest his elbow on the pole, which was apt to spring up with great force, and thus subject his arm to a violent jerk at the shoulder. Having met with a case of axillary aneurism which was caused by the patient simply raising his arm to prevent his hat from being blown off as he got out of a railway carriage, I deemed this explanation sufficient.

In the course of a few days after admission, the tumor enlarged considerably, and assumed a dark color at some parts of its surface; while a slough formed over the scapula, where the pressure was most severe. At the same time the patient began to wander in his ideas, and his pulse rose to 130. It was therefore manifest, that unless some decided steps were taken without delay to afford relief, the result must very soon prove fatal. Ligature of the subclavian was quite out of the question, from the tumor extending above the clavicle; and amputation at the shoulder-joint at first seemed to be the only alternative. But before proceeding to this desperate remedy, I felt desirous of ascertaining the state of matters in the axilla, and therefore proceeded in the following manner:

On the 1st of February, chloroform having been administered, I made an incision along the outer edge of the sterno-mastoid muscle, through the platysma myoides and fascia of the neck, so as to allow a finger to be pushed down to the situation where the subclavian artery issues from under the scalenus anticus and lies upon the first rib. I then opened the tumor, when a tremendous gush of blood showed that the artery was not effectually compressed; but while I plugged the aperture with my hand, Mr. Lister, who assisted me, by a slight movement of his finger, which had been thrust deeply under the upper edge of the tumor and through the clots contained in it, at length succeeded in getting command of the vessel. I then laid the cavity freely open, and with both hands scooped out nearly seven pounds of coagulated blood, as was ascertained by measurement. The axillary artery appeared to have been torn across, and as the lower orifice still bled freely, I tied it in the first instance. I next cut through the lesser

pectoral muscle close up to the clavicle, and holding the upper end of the vessel between my finger and thumb, passed an aneurism needle so as to apply a ligature about half an inch above the orifice. The extreme elevation of the clavicle, which rendered the artery so inaccessible from above, of course facilitated this procedure from below. Everything went on favorably afterward. The edges of the wound, which had been brought together by stitches of the silver suture, united chiefly by the first intention. The ligature was found loose on the thirteenth day, the pulse gradually decreased in frequency as the patient regained his strength, and the discharge, which was at first profuse and mixed with clots of blood, progressively diminished. He was dismissed on the 14th of March, six weeks after the operation, and before long resumed his employment, in the possession of perfect health.

When this case was communicated to the London Medico-Chirurgical Society, a professor of surgery, whose ideas on the subject must be rather peculiar, contended that the aneurism was *traumatic!!* so as not to imply unsoundness of the artery. I may therefore mention that the patient having died lately from aneurism of the aorta, it was found on dissection that his arterial system was in a state of general and extreme degeneration.

A circumstance in this case which appears to me particularly deserving of attention in a practical point of view, is the method that was employed to obtain command over the artery before it was tied, since, unless this had been done, it is obvious that a fatal hemorrhage must have speedily ensued after the sac was opened. Thirty years ago I acted upon the same principle in my first operation for removing the superior maxillary bone. An attempt had been previously made in another case, and by another person, to accomplish this object, but without success, on account of the hemorrhage; and, although at a loss to understand how it should prove troublesome if the incisions were properly conducted, I resolved to obtain command over the only source from which the blood could proceed from the deep part of the wound, which was the internal maxillary artery. With this view I made an incision between the ramus of the jaw and mastoid process, so as to enable the gentleman who assisted me, the late Sir George Ballingall, to introduce his finger and compress the vessel on the neck of the condyle. This had the desired effect, which, as I expected, proved quite unnecessary, and the operation was completed, for the first time in Great Britain, on the 15th of May, 1829.

I venture to hope that, through the employment of this expedient, axillary aneurisms not amenable to ligature of the subclavian artery

may be remedied by the old operation; and I am inclined to think that, even in cases where the former procedure is practicable, the latter may be preferable. Upon two occasions, as already said, I have tied the subclavian artery for aneurism with perfect success, and have therefore no prejudice against the operation; but nevertheless, I feel satisfied that it is much more difficult of execution, more apt to be followed by hemorrhage, as well as fatal inflammation of the deep textures, and less certain to afford relief, than the other method, for it by no means necessarily follows that, after the artery has been tied, the contents of the aneurism are always absorbed, while, when the sac is opened, the whole of the effused blood is at once removed.

Case II.

About twelve months ago, Dr. Embleton of Embleton in Northumberland, placed under my care another axillary aneurism. The patient was a farmer and fish-curer, about fifty years of age, of a robust frame and highly excitable disposition. The tumor was the size of an orange, and extended from the axilla downward. It had commenced about a year before without any distinctly assignable cause, and increased slowly until the last month or six weeks, during which its progress becoming more rapid, rendered relief very desirable. In conformity with the views that have been explained, I did not hesitate to choose the old operation as most expedient for this purpose, and accordingly performed it on the 17th of August.

Finding that the radial artery, having a very high origin, ran over the surface of the sac, I took care to avoid it in laying open the cavity, and then, having turned out the clot, had no difficulty in tying both orifices of the vessel, the pulse at the wrist remaining undisturbed. Next day the patient was restless, with hurried circulation and confusion of ideas. On the following day his condition distinctly assumed that of delirium tremens, to which I then, for the first time, learned his habits strongly predisposed him. At the same time the arm became greatly swelled from the shoulder downward, at first of a red and afterward of a yellowish color. The constitutional disturbance then gradually subsided, but suppuration and sloughing of the subcutaneous cellular texture took place, requiring incisions at different parts of the limb. Yet notwithstanding these adverse circumstances, so rapid was the subsequent process of improvement, that in less than a month after the operation the patient returned home, where he soon regained his health.

It cannot, I think, be doubted that the threatening of gangrene in

this case proceeded from the constitutional tendency to overaction, and that if the artery had been tied above the origin of the radial, the result would in all probability have been fatal.

XXVIII.

ANEURISM OF THE COMMON CARTOID ARTERY.

Four years ago I received the following letter from Mr. Haldan of Ayr:

AYR, 10*th June*, 1857.

MY DEAR SIR:—I saw a man, named David Craig, living in the neighborhood of Dalry, yesterday. He has an aneurism of considerable size, on the left common carotid, low in the neck. I advised him to lose no time in putting himself under your care, if you will have the kindness to admit him into your wards. The history is as follows: Seven weeks ago, in a brawl, he was stabbed in the neck, on the left side; the wound was about an inch in extent superficially, and situated immediately over the track of the great vessels, an inch and a half above the sterno-clavicular articulation. The wound was received in a rather dark room, about two o'clock in the morning, and he was discovered almost immediately after lying in a great quantity of blood. I believe the hemorrhage had by that time stopped. About four o'clock in the afternoon, while answering some questions that were being put to him by a police constable, violent hemorrhage again occurred, and in five minutes he was all but dead. The hemorrhage is described as *not* having occurred, per saltum, but the blood as being of a rather red color. I saw him, as a medico-legal case, twenty-five hours after the injury. He was then very pale and weak. The wound had been brought together by three sutures after the second bleeding. There was a small flat tumor, as of a clot, lying over the vessels, and to which a pretty firm impulse was communicated. The pulsation of the right carotid was very feeble. I did not see the case again till yesterday, when I was informed that the small tumor observed after the injury slowly decreased in size, and, about eight days ago, the present tumor was observed, and that since that time it has been rapidly increasing. I am, etc., JOHN C. HALDAN.

The man was to go into Edinburgh to-day.

The patient, a young man, æt. twenty, was admitted into the hospital on the 10th of June. The aneurism, which was about the size of an orange, extended in a transverse direction from the trachea to the outer edge of the sterno-mastoid, and downward close to, or rather under, the clavicle, throbbing throughout with great force. Nearly at the center there was a cicatrix, showing where the wound had been. In the course of a few days, notwithstanding confinement to the horizontal posture, and low diet, there was a distinct enlargement of the tumor, so that it seemed necessary to decide without delay upon the course to be pursued.

The case was obviously one of great responsibility, involving, as it did, not only the patient's life, but also that of his assailant. There could be no doubt that if the aneurism were allowed to proceed it would before long prove fatal, by interfering with respiration, or opening inwardly if it did not do so upon the external surface. On the other hand, it was evidently impossible to tie the artery below the tumor, while an aperture could not be made into it without subjecting the patient to instant and extreme hazard. The wound of the artery might be opposite the cicatrix, but it might also be situated at a lower point if the knife, as was not improbable, had a downward direction, in which case it would hardly be possible to apply a ligature; and, wherever situated, it could afford little assistance in discovering the vessel, since the pressure which had been in operation for nearly two months must have so consolidated the textures as to render their recognition and separation equally difficult. There thus seemed to be not only a great risk of the hemorrhage proving incontrollable, but also a hardly less formidable danger of injuring the internal jugular vein. Having carefully balanced these different considerations, I arrived at the conclusion that it was my duty to give the patient his only chance of escape, and proceeded to perform the operation on the 17th of June.

Chloroform having been fully administered, and the patient being placed upon his back, with his shoulders slightly elevated, I pushed a knife through the cicatrix, and followed the blade with the fore-finger of my left hand so closely as to prevent any effusion of blood. I then searched through the clots and fluid contents of the sac for the wound of the artery, and found that pressure at one part made the pulsation cease. Keeping my finger steadily applied to this point, I laid the cavity freely open both upward and downward, turned out the clots, and sponged away the fluid blood so as to get a view of the bottom, which presented the smooth shining aspect of a serous membrane, without the slightest indication of either the artery or vein that

could be seen or felt. In order to make the requisite dissection, I next attempted to close the orifice by means of forceps, but found that it had the form of a slit which could not be thus commanded. It was also so near the clavicle that pressure could not be employed below it, and, to my still greater concern, lay on the inner, or tracheal side of the vessel, so that the compression required for its closure, instead of being backward upon the vertebræ, was outward upon the vein. In these circumstances it seemed proper, so far as possible, to lessen the opposing difficulties, and I therefore ran a bistoury through the skin and the sternal portion of the sterno-mastoid, so as to divide this part of the muscle, together with the superjacent integument. I then seized the edge of the slit in the artery, as it lay under my finger, with catch forceps, and desired them to be held so as to draw the vessel toward the trachea, while still subjected to compression; then carefully scratched with the point of a knife until the arterial coat was brought into view at its external edge, a little above the aperture, where a ligature was passed by the needle and tied. I repeated the same procedure below the wound, and, when it was completed, had the satisfaction of finding that my finger could be withdrawn without the slightest appearance of bleeding, instead of the tremendous gush which had previously attended its slightest displacement. The ligatures separated on the tenth day, and the patient, who had suffered no inconvenience since the operation, was dismissed on the 17th of July.

I have thus particularly related the steps of this operation, because it was by far the most arduous that has ever occurred in the course of my surgical experience. Indeed, even now I cannot, without a shudder, reflect on my position, when the slightest displacement of one hand must have instantaneously caused a fatal hemorrhage from the carotid artery, and a wrong direction of the needle by the other, to the smallest possible extent, would have given issue to an irrepressible stream from the jugular vein.

XXIX.

LIGATURE OF THE CAROTID ARTERY FOR AN ANEURISMAL TUMOR OF THE ORBIT.

In 1809 Mr. Travers tied the carotid artery with success for the remedy of what he regarded as an "aneurism by anastomosis in the orbit." Since then various cases of a similar kind have been placed

on record; but the one about to be related is, so far as I know, the first that has occurred in Scotland.

Mrs. B., aged twenty-two, recommended to my care by Dr. Adamson of St. Andrews, was admitted into the hospital on the 26th of June, 1860, on account of protrusion of the right eyeball, which was so projected that the lids could hardly meet over it, the lower one being everted, with great vascular swelling of the conjunctiva. In the hollow of the orbit on the upper side, and along the frontal ridge, a pulsating tumor could be felt. The patient complained of an unceasing and most distressing noise in her head, which could also be heard by applying the ear to any part of it. When pressure was made on the carotid, all these symptoms were suspended, the orbital tumor subsiding, and the noise, together with other disagreeable feeling, suddenly ceasing. But if the pressure was at once withdrawn, there instantly occurred an intolerable sensation of pain in the head, which it was stated sometimes lasted for several days, while a gradual removal of the compression was not productive of any similar consequence.

In the preceding month of October the patient had noticed a slight tendency to protrusion of the eye, which, when mentioned to her friends, was treated with disregard, and did not prevent her from being married in the December following. Four or five weeks after this event she suddenly felt a smart pain in the right temple, which lasted for a couple of hours, and was speedily followed by distinct protrusion of the eyeball, with double vision. Attacks of the same kind occurred afterward, with intervals of from three to ten days, and then the state of matters became such as has been described. In these circumstances Dr. Adamson and Mr. Watson Wemyss, of Denbrae, who before he relinquished the profession devoted much of his attention to ophthalmic surgery, and in whose neighborhood the patient resided, were of opinion that ligature of the carotid afforded a fair prospect of recovery; and, taking the same view, I did not hesitate to perform the operation.

On the 3d of July I tied the carotid immediately above the crossing of the omo-hyoideus, with the effect of instantly relieving the patient from all her uncomfortable feelings. A few days afterward, as the ectropium of the lower eyelid still remained, I removed by scissors the whole projecting conjunctiva. On the 9th the eye was nearly natural in its position, and the double vision had ceased. On the 17th the ligature separated, and on the 27th the patient was dismissed.

The circumstances of this case have a remarkable resemblance to those of the one originally related by Mr. Travers, and most of the others since recorded. There is the adult age—the female sex—the

sudden pain—the noise in the head—the protrusion of the eyeball—the eversion of the eyelid—the pulsatory enlargement at the margin of the orbit—and the remedy by ligature of the carotid. The symptoms are so similar to those of aneurism by anastomosis, that it seems at first sight as if there could be no doubt in regard to the nature of the disease. But it must be admitted that the suddenness of commencement, without any premonitory sign or congenital preparation, together with the effectual relief afforded by tying the arterial trunk leading to the part concerned, are not consistent with the ordinary features of an aneurismal erectile tumor. The only opportunity of solving the difficulty by dissection occurred in the practice of Mr. Nunnely, who tied the carotid for what seemed to be a tumor of the kind in question; but, on examination of the patient, who died soon after the operation, did not find any distinct evidence of the disease. While the pathology of this peculiar derangement thus remains obscure, it is satisfactory to learn that in such cases the carotid artery may be tied with almost the certainty of affording complete and permanent relief.

XXX.

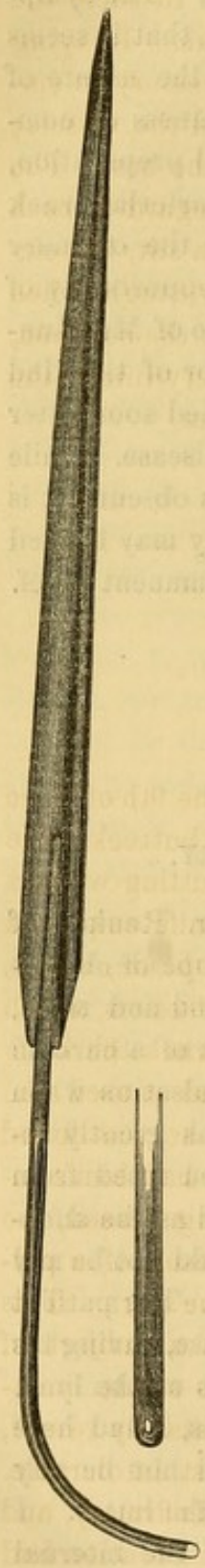
LIGATURE OF THE INTERNAL ILIAC ARTERY.

F. S., twenty-two years of age, recommended by Dr. Ranken of Carluke, was admitted on the 15th of May last, in the hope of obtaining relief from a tumor in his left buttock. It was round and tense, lying over the sciatic notch, and presenting the aspect of a chronic abscess; but being found to have a strong expansive pulsation when the hand was placed over its surface. The swelling was greatly reduced in bulk by pressure, but speedily regained it when freed from restraint, with a still more forcible distending throb; and as the aneurismal bruit was also very strongly pronounced, there could not be any doubt entertained in regard to the nature of the disease. The patient stated that he had only lately become aware of the disease, having his attention directed to it by pains in his hip and weakness of the limb.

In choosing between the Hunterian and old operations, I had here no hesitation in preferring the former, since there could not be any certainty as to the arterial orifice being within reach of the latter. I was not acquainted with any well-authenticated case of the internal iliac having been tied successfully in Europe, but knew that this had been done elsewhere; and therefore felt no reluctance to undertake the

task, though aware that it must be attended with difficulty from the deep situation of the vessel, the shortness of its course, and the vicinity of large veins.

Fig. 27.



On the 29th, chloroform having been administered, I made an incision, about six inches in length, from a little above the middle of Poupart's ligament, in a crescentic form, at first upward and outward, and then upward and inward, passing the superior spinous process of the ilium at the distance of rather more than an inch. I then exposed the aponeurosis of the external oblique muscle, and ran a blunt-pointed bistoury through it, together with the muscle, to the full extent of the first incision. In the next place I made an opening at the lower part of the wound through the internal oblique and transverse muscles, together with the fascia transversalis, so as to admit the point of my finger, upon which the bistoury was guided so as at once to divide completely the whole of these parts. The only vessel requiring ligature, which was a small branch of the circumflexa ilii, having been tied, I pressed the peritoneum inward, and without any delay or groping placed my finger on the bifurcation of the common iliac. Finding that any attempt to bring the vessel into view would be quite impracticable, I proceeded to pass the needle under it with such guidance as was afforded by the very distinct perception of its coats, which in this situation are so loosely connected with the neighboring parts as to render this mode of procedure less dangerous than it might appear at first sight. Feeling the point fairly past the artery, I slid down a pair of dressing forceps, seized the thread, disengaged it, and completed the ligature with all the tightness possible. The tumor immediately became greatly reduced in size, and entirely lost its pulsation, but at the end of two days slightly regained it, and afterward varied in this respect; while the diminution of size was steadily progressive; so that the patient, feeling quite well, went home on the 29th of July.

I may here remark that the operation was greatly simplified by the method I adopted in dividing the muscles, since they were so thick that if they had been cut through by degrees the process must necessarily have proved tedious

and embarrassing; while the slight adhesion that exists between the fascia transversalis and peritoneum opposed none of the resistance which would have been encountered if I had attempted to carry the knife along the external surface of the former membrane. In tying deep-seated arteries, it has been frequently thought necessary to employ complicated ligatures for passing the ligature round the vessels; but I feel quite sure that the simplest form of needle is the best. The one I used is represented very accurately in Fig. 27, in regard to both form and size. It will be observed that the eye is not a slit, but circular and close to the point, so that the thread is readily caught when conveyed beyond the vessel. With this needle, besides the common, external, and internal iliacs, I have tied the femoral artery thirty, the humeral ten, the carotid six, and the subclavian four times.

XXXI.

GLUTEAL ANEURISM.

J. C., aged forty-four, from Carlisle, was admitted on the 9th of June last, suffering from a very formidable aneurism of the left buttock. He stated that seven years ago, having been employed in cutting willows for basket making, he placed in his coat pocket the knife employed for this purpose, which had a long, narrow, and sharp blade, with a large, thick wooden handle, and then threw the bundle of osiers, which he had collected, over his shoulder. In doing this he struck the knife with such force as to drive it deeply into the hip, and caused the blood to flow with great profusion. Soon afterward he was found lying in a very exhausted state by some children, who had him conveyed to the Carlisle Infirmary, where, bleeding having ceased, the wound was dressed superficially, and healed, with the result of a pulsating tumor, the size of an orange, being formed at the part. This had occasioned little inconvenience, and rather been a subject of amusement to himself and friends, until lately, when it suddenly enlarged, and became the source of pain, which was constantly severe, but occasionally increased to a degree that was almost intolerable. He had on this account again applied to the Carlisle Infirmary, and resided there for two or three weeks, during which an embrocation had been employed and a plaster prescribed. He then left the hospital, and was recommended to my care by Dr. Elliot.

On examination I found an enormous tumor, measuring more than thirteen inches across in both of its directions, extremely tense, and pulsating strongly, while the pain had become still more intolerable through the fatigue of traveling. It was evident that there should be no delay in resorting to some effectual means of relief; and of these I could not hesitate in preferring the old operation, since, although the case was more favorable for ligature of the internal iliac than the one in which I had recently operated, from the greater thinness and laxity of the muscular coverings, the large size of the tumor was opposed to the process of coagulation and absorption, while the patient's history clearly showed that the vessel must be within reach at the seat of injury. I therefore resolved to follow this course, and proceeded to do so on the 14th.

The patient having been rendered unconscious and placed on his right side, I thrust a bistoury into the tumor, over the situation of the gluteal artery, and introduced my finger so as to prevent the blood from flowing, except by occasional gushes, which showed what would have been the effect of neglecting this precaution while I searched for the vessel. Finding it impossible to accomplish the object in this way, I enlarged the wound by degrees sufficiently for the introduction of my fingers in succession, until the whole hand was admitted into the cavity, of which the orifice was still so small as to embrace the wrist with a tightness that prevented any continuous hemorrhage. Being now able to explore the state of matters satisfactorily, I found that there was a large mass of dense fibrinous coagulum firmly impacted into the sciatic notch, and—not without using considerable force—succeeded in disengaging the whole of this obstacle to reaching the artery, which would have proved very serious if it had been allowed to exist after the sac was laid open. The compact mass, which was afterward found to be not less than a pound in weight, having been thus detached so that it moved freely in the fluid contents of the sac, and the gentlemen who assisted me being prepared for the next step of the process, I ran my knife rapidly through the whole extent of the tumor, quickly turned out all that was within it, and had the bleeding orifice instantly under subjection by the pressure of a finger. Nothing then remained but to pass a double thread under the vessel and tie it on both sides of the aperture.

The patient did perfectly well after this operation, with exception of complaining that he felt pain at the upper part of the thigh, for which I could not satisfactorily account until about three weeks afterward, when I discovered a deep-seated abscess lying over the sciatic nerve. The matter having been evacuated by a free incision, there

was immediate and complete relief, so that the patient was dismissed on the 29th of July perfectly free from complaint, and was soon afterward able to resume his occupation.

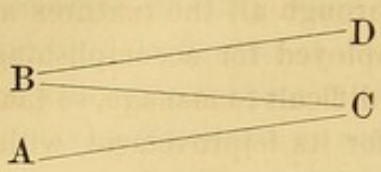
XXXII.

AVULSION OF THE ENTIRE SCALP.

On the 2d of February last, M. C., about twenty-four years of age, the daughter of a farmer in Perthshire, applied to me for relief from a very unseemly and inconvenient condition of the upper and lower lids of her right eye, the former being everted with great expansion of the conjunctiva, and the latter so much elevated as to make vision impracticable unless when it was held down. Upon inquiring into the history of this condition, I was told that about eight years ago the patient, while standing beside her father in his threshing mill, had her hair, which was very long, caught by some part of the machinery, and pulled with such force as instantly to tear away the whole scalp, including the eyebrows, so that instead of the light-colored locks there was suddenly presented to the horrified view of her parent the bleeding surface of a bare cranium. Contrary to what might have been expected, the healing process had gradually completed cicatrization, except at a small part toward the vertex, where there was still a slight discharge of matter, all the bones being elsewhere covered by a smooth shining pellicle resting directly upon them; while the ears, eyelids, and other parts in the vicinity of the lost integument were drawn up to assist in supplying its place. The hair that caused the accident had been formed into a wig, which formed a comfortable covering for the head, and by its amplitude presented a surprising contrast to the bare poll.

In order to remedy the displaced condition of the eyelids, which was the only complaint of any consequence that remained as an effect of this remarkable injury, it appeared requisite that both the upper and lower one should be depressed. With this view, after removing the hypertrophied and projecting conjunctiva, I made two incisions along the lower lid, so as to form a triangular flap, having its base at the outer angle and its apex near the inner canthus. This portion of skin having been detached from its subjacent connections, I made an incision from the upper end of its base along the other lid, and having

separated the cut edges, inserted the flap between them so as to increase the breadth, and consequently lower the level of this one, while the lips of the wound in the lower lid, being united by sutures, depressed it sufficiently to leave the eyeball uncovered. The incisions, in short, were made in this form,—the flap, A B C, being inserted between the edges of B D. The result was in every respect satisfactory, and the patient left the hospital quite pleased with her improved appearance, on the 2d of March.



XXXIII.

REMEDY OF REDUCIBLE HERNIA.

The permanent remedy of reducible hernia has long been regarded as an important object of surgery; and it is difficult to estimate the amount of misery that would be prevented by effectual means for this purpose. The numerous trials daily made by those who can afford the requisite expense and trouble for obtaining a perfect mechanical support, afford the best evidence of what must be endured by poor people, who must be content with the bandage supplied by some charitable institutions, or obtained through their own scanty resources. From my own observation, indeed, I can testify that in a very large proportion of such cases the truss does more harm than good, by pressing on the protrusion instead of restraining it. If, therefore, the abdominal apertures could be closed by surgical procedure a great benefit would unquestionably be conferred upon suffering humanity, and hence, after all the other proposals for accomplishing this object had proved unsatisfactory, the operation of Professor Wutzer met with a very favorable reception. The sanguine expectations of its complete success, which were at first so freely entertained and frankly expressed, have of late been somewhat chilled by the reports of numerous relapses; but as these may have been owing to some imperfection of the procedure, I still venture to hope that a step has been taken in the right direction, and that if not able to cure all cases of the kind in question, we shall at least have it in our power to remedy some of them, and relieve others.

Nothing can be more simple in theory than the procedure of M.

Wutzer, which is to push up the integument so as to invaginate it within the inguinal canal, and attach its highest point within the tendinous aperture by thrusting a needle through all the textures at this part. But the apparatus originally employed for accomplishing this object is extremely complicated and very difficult to manage, so that various modifications have been proposed for its improvement, without, so far as I know, at all lessening either of these objections. For my own part I was deterred from attempting to perform the operation by the complexity of means thus employed in its performance; but regarding the principle of treatment as deserving of confidence, adopted the following plan of carrying it into execution:

Instead of a complicated machine for distending the invaginated integument, I employed a piece of bougie or gutta-percha, to one end of which was attached a strong double thread. The plug thus prepared and smeared with cantharides ointment, was drawn into its place by the threads, which, by means of a curved needle, guided on the finger fairly within the ring, were passed, at the distance of rather more than an inch from each other, through all the textures to the surface, where they were tied firmly together, on a piece of bougie, to prevent undue pressure on the skin. It was feared by some that the substitution of a thread for the needle, as a means of retaining the displaced parts in their new position, would produce an undue degree of irritation, but I regarded the difference of effect that might be thus anticipated as favorable for the purpose in view, and I have not met with any unpleasant symptoms from this source. The advantages of this procedure are—1, that it may be executed by means which are in the possession of every surgeon, instead of the complicated, expensive, and not easily manageable apparatus hitherto deemed indispensable; 2, that it may be accomplished with much more certainty through the secure guidance of a finger, than by trusting to a piece of wood for gaining admission within the tendinous ring; 3, that the two threads, co-operating in their effect, render the chance of adhesion between the textures much greater than when it is attempted by the mere puncture of a needle.

Case.

A. W., aged twenty-one years, a seaman, was admitted into the hospital on the 30th of January last, on account of an inguinal hernia, from which he had suffered two years. As the aperture was wide, and the tendency to protrusion very strong, I deemed the case a proper one for this operation, which was accordingly performed in the way that has been described, on the 1st of February. The plug was

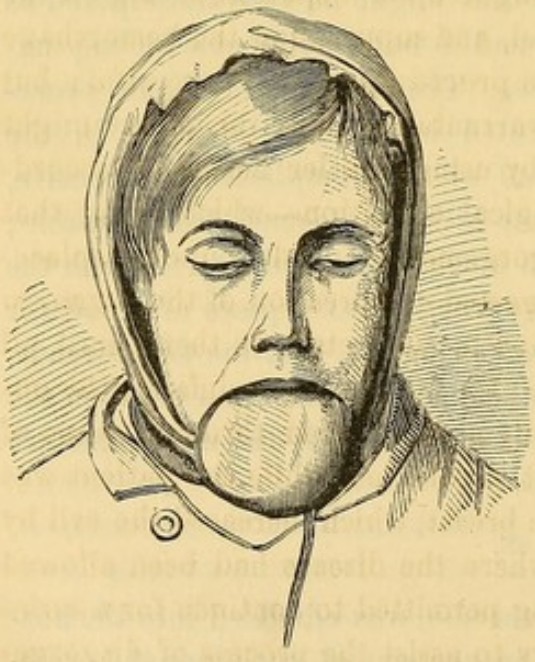
removed on the 11th, and on the 25th the patient was allowed to walk about the ward. On the 6th of March I submitted him to the inspection of the Med. Chirurg. Society, the members of which were satisfied that there was no tendency to protrusion—no impulse on coughing—and that the parts at the ring felt firm, while the invaginated portion of integuments admitted a finger to nearly its whole length.

XXXIV.

PROLAPSUS LINGUÆ.

It is to M. Lassus of Paris that we are indebted for the first systematic account of what he proposed to call Prolapsus Linguæ. In his Surgical Pathology, and more fully in the Memoirs of the Institute, from his own experience, and the detached observations of preceding authors, he has described the disease thus designated, explained its nature, and endeavored to establish what seemed to him the proper principles for conducting its treatment. The representation here given of the case that I am about to relate will convey some idea of the shocking appearance by which this derangement is characterized. The tongue protruding to the extent of three inches or more, so as nearly, if not quite, to touch the sternum, and thickened in a corresponding degree, so as to assume a globular form, impedes articulation, mastication, and deglutition, presses forward the teeth of the lower jaw, which are usually incrusted with tartar, or altogether displaced, while the jaw itself is altered in form, or rather retains the obtuse angle of infancy, so that, even when relieved from the resistance of the tongue, it cannot be brought into contact with the upper one. The surface of the tongue is of a brown or bluish color, roughened with tubercular elevations, and frequently

Fig. 28.



ulcerated, with a tendency to bleed. The lower lip is completely everted, and allows a constant discharge of saliva, which greatly increases the patient's discomfort. It is indeed surprising that existence can be tolerated in such distressing circumstances, and yet most of the cases on record had existed from ten to fifteen years; while, in one related by Sandifort, the patient, who was a lady in Leyden, had endured the deformity for no less than forty years, with the very imperfect palliation afforded by the covering of a silver case, which she had had constructed to conceal it from view.

It appears that the disease is usually, if not always, congenital; and Lassus says, that Gaspar Peucer was the first to remark that infants were sometimes born with their tongues hanging out of their mouths, like that of a recently slaughtered calf. Indeed, there is one instance on record of a fœtus in utero presenting the protrusion. It has naturally been attributed to a morbid enlargement of the tongue; but Lassus maintains that this is an effect, and not the cause of the disease, which he believes to be displacement of the organ. He therefore regarded, as altogether unnecessary and improper, any interference by cutting instruments, as was employed in the case of a young lady at Stockholm, on whom Hoffman, a distinguished surgeon, carried into execution the decision of a consultation, comprehending the whole Medical Society of that city, which had been assembled, in 1695, to consider the case, by placing the tongue upon a spatula, slicing off the protruding part by means of a chisel, and suppressing the hemorrhage by red-hot irons. This rather rude procedure proved successful; but according to Lassus was quite unwarrantable, since the object might have been equally well obtained by using gentler means, in accordance with his view of the pathological condition—which being that the enlargement was merely an engorgement dependent upon displacement of the tongue, obviously suggested compression of the organ, so as to induce its return into the mouth, and retain it there until all tendency to protrusion had ceased. He found that, in infants, the object thus held in view could be easily accomplished through means of a bandage applied so as to prevent protrusion, while the patient was fed by a spoon, and taken from the breast, which increased the evil by the action of sucking. In cases where the disease had been allowed to become more confirmed, by being permitted to continue for a series of years, he considered it necessary to assist the process of disgorgement by applying leeches and lotions calculated to promote contraction of the distended organ. But on no occasion did he think it requisite or justifiable to remove any portion of the tongue.

The more recent records of surgery contain little additional information with regard to the nature and symptoms of this disease, and in so far as its treatment is concerned, tend rather to perplex the subject by the diversity of practice which has been followed. For my own part, I have met with only three cases of this kind; but, as they have proved very instructive, and led me to entertain definite ideas as to the mode of treatment, I think it may be useful to relate them, together with the practical views which they have suggested. The first was that of a girl twelve years of age, who was recommended to my care by Dr. David Arrott of Arbroath. The prolapsus had existed from the time of birth, and attained so large a size that its remedy seemed impracticable without removal of the redundant portion. I therefore performed the operation by means of a ∧ shaped incision, tied the bleeding vessels, and united the cut edges by sutures. The wound healed without any bad consequences; but, to my great surprise, in the course of a short time the tongue had resumed, to the full extent, its bulk and form, so as apparently to be in no respect different from what it had been previously to the operation. The tumor was then moistened with a strong solution of the sulphate of copper, and subjected to the pressure of a bandage, under which it gradually diminished in size, so as to be reducible within the mouth. But when the prospect of a satisfactory result was thus so favorable, the patient, from being unfortunately exposed to cold, suffered an attack of laryngitis, which speedily proved fatal.

The experience thus acquired naturally led me, in accordance with the opinion of Lassus, to regard excision as improper, and compression as the preferable remedy; but no opportunity of acting upon this principle presented itself until R. M., aged fifteen, recommended to my care by Dr. Malcolm of Perth, was admitted into the hospital on the 4th of March, 1856. The representation above given (Fig. 28) will show the appearance then presented by the prolapsed tongue, which was said to have been unnaturally large at the time of birth, and to have afterward increased, especially at the period of teething, and more recently after an attack of scarlatina. It was of a globular form and brownish color, with irregular elevations on the surface, and a painful ulcer at one part from the irritation of the teeth.

A strong solution of sulphate of copper—℈j to ℥j—having been applied on lint, the tongue was compressed by a bandage; and the following measurements, which were carefully taken by my house-surgeon, Dr. Marshall, now surgeon of the Bristol Infirmary, will show the progress of diminution:

MEASUREMENTS.

March 7th, circumference 8 inches, length 2½ inches.

"	8th,	"	7	"	"	2¼	"
"	9th,	"	6½	"	"	2¼	"
"	10th,	"	5¾	"	"	2¼	"
"	11th,	"	5¼	"	"	2¼	"
"	12th,	"	5	"	"	2	"
"	13th,	"	4¾	"	"	1¾	"
"	14th,	"	4⅝	"	"	1¾	"
"	15th,	"	4½	"	"	1¾	"
"	16th,	"	4¼	"	"	1¾	"
"	17th,	"	4	"	"	1¾	"

March 22.—Bandage and lotion continued. Tongue now projects one inch only from the incisors, but the circumference remains the same.

April 1.—Projection reduced to half an inch; circumference the same. Is able, with an effort, to close his lips over the tongue.

On the 14th of April, as no further change had taken place, and as the tongue could not be retained within the mouth except by a voluntary effort of the lips, from the lower jaw being so much altered in form as to prevent the teeth meeting sufficiently to do so, I removed the small redundant portion by means of curved scissors applied transversely. Two vessels having been tied, the edges of the wound were stitched together. No bad consequence followed, and the patient was dismissed cured on the 18th of May.

In reply to a letter, requesting Dr. Malcolm to acquaint me with the patient's subsequent progress, I received the following account:

PERTH, January 14th, 1857.

MY DEAR SIR:—Shortly after the receipt of your letter, I visited, at Forteviot, the boy Monteath, upon whom you operated for enlarged tongue. He has grown to be a fine tall young man, and is working with his father in a quarry, where he was employed when I called for him. He speaks and reads very distinctly, only with a lisp, but not more than hundreds of people in the world. I examined his mouth, and especially the lower jaw; the teeth meet to the first grinders, and then are separated. I told him that it was at your request I examined him; and he said that he finds that his front teeth are gradually approximating, and that the upper and lower jaws are much nearer each other. When I first saw him, and before your operation, he had a constant flow of saliva from his mouth: there is nothing of the kind now; he eats and drinks with perfect ease. Some relations of his,

from a distance, came to visit his parents at the holidays, and, upon seeing him, did not know him.

As the lower jaw is so much disposed to approximate the upper jaw, I recommended him to persevere and wear an apparatus on the chin from the top of the head, which, by constant pressure, would assist this effort of nature in completely restoring the symmetry of the face, now that the cause of deformity is removed. It is only by the front face that you can see that there is any peculiarity in his appearance; his profile is perfect.

Yours very sincerely, WM. MALCOLM.

From what has been said, I think it will appear that Lassus was right in regarding compression as the principal means of correcting prolapsus linguæ; and that even when, from the long duration of the disease, with consequent difficulty of replacement from alteration in the form of the jaw, it may be found requisite to curtail the organ, this should not be done until the tongue has, so far as possible, been reduced to its natural size. The incision will thus be limited to the smallest extent, and the texture concerned will be in the most favorable condition for healing.

CASE III.

C. D., seven years of age, from Perthshire, was admitted on the 4th of March, 1859, on account of Prolapsus Linguæ, from which he had suffered four years. The tongue protruded in a globular form, and of a brown color to the extent of more than two inches. The teeth of both jaws, but particularly the lower one, were pushed forward out of their proper place, and there was a constant discharge of saliva productive of great discomfort.

Pressure was applied as in the last case, and with such effect that a daily diminution could be noticed until the end of a fortnight, when the swelling became stationary. On the 4th of April, therefore, I removed the still redundant portion by means of scissors, and soon afterward the recovery might be regarded as complete, but for the alteration in form, which the lower jaw had experienced from pressure by the enlarged tongue. This was so great that the front teeth were more than an inch apart. In course of time, however, this defect gradually disappeared, and I heard about a year afterward that the boy had got quite well. He was dismissed on the 8th of May.

XXXV.

LITHOTOMY.

Cases within the last Sessional Period of Nine Months.

Name.	Age.	Date.	Weight of Stone or Stones.	Results.
1. J. C.	6	Jan. 13	℥vi.	Cured
2. H. A.	67	Feb. 13	℥ij. ℥iii.	Cured
3. R. M.	65	May 4	℥vj. ℥ij.	Cured
4. P. D.	22	June 21	℥j. ℥v.	Cured
5. J. R.	34	July 12	℥ij. ℥i.	Cured
6. J. D.	3	July 30	℥ss.	Cured

I mention these cases merely as a text for the expression of my opinion that, of all the methods which have hitherto been devised for the removal of stones from the bladder by incision, the lateral operation as performed by Cheselden is the best, and that the various proposals which have been suggested for its improvement are so many steps in a wrong direction. It is indeed too much the custom of young operators, when they meet with unfortunate cases, to account for their failures by attributing them to some fault of the method pursued; and there can be no doubt that in the modern teaching of surgery there is more attention paid to the mode than to the principle of performance. The fiddle-faddle instructions that emanate from some schools of the present day, not only for using but even for holding a knife, sufficiently denote the poverty of intellect whence they proceed, and the lowness of aspiration to which they are addressed. All intelligent students should regard such trivialities as beacons to warn them against a system of instruction that can tend only to cramp the faculties and impede the attainment of excellence.

Instead, then, of studying the endless appliances which have been suggested for supplementing or replacing the simple knife, staff, and forceps, or the various directions in which it has been proposed to make the prostatic incision, it will be useful for any one who desires to remove urinary concretions with safety, to consider what is really requisite for success. In the first place, there must be an ample aperture in the integuments, for access to the deeper parts, and allowing the urine to escape; secondly, a free division of the perineal muscles, to prevent their subjecting the bladder to injurious pressure, by squeezing it between them and the forceps when the stone is drawn down; and thirdly, a section of the prostate fairly through the tough

resisting band at its base, which cannot be torn without the certainty of causing fatal consequences. Mr. Liston propagated a most deadly doctrine when, in regard to the prostate, he taught, that "the less cut the greater the patient's safety," since even he was at length brought to admit that there is a part at the base of the gland "which effectually prevents dilatation or enlargement of the orifice of the bladder beyond a certain and very limited extent, without laceration, dreadful suffering, and imminent danger." But even after the prostate has been divided thus far, it not unfrequently proves so tough and unyielding as to require one or more applications of the knife—the surgeon constantly endeavoring to obtain the requisite space by dilatation, but never using such a degree of force for this purpose as experience has proved to be dangerous. "If I find the stone very large," says Cheselden, "I cut upon it again as it is held in the forceps." And so every prudent surgeon should do, instead of overcoming the resistance by a mere exercise of strength.

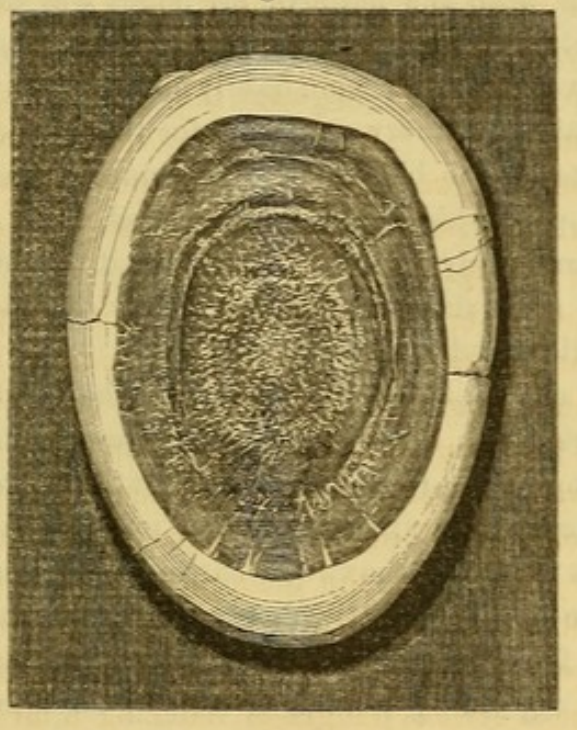
When the lithotriptic process seemed to approach perfection, it was supposed by many people that there would soon be no further occasion for lithotomy, from the care with which patients might be expected to apply for relief at an early period of their complaint, while the concretion was still within reach of crushing; but the time which has since then elapsed affords sufficient proof that such expectations were altogether illusory, as the recognition of stones, in regard to their size, is still very much the same as it was in former days; while repeated attempts to break them and comminute the fragments are beset with the most serious danger of inducing a far more distressing condition than the one under treatment. This is the chronic inflammation, or what has been called catarrh of the bladder, which, instead of subjecting the patient to occasional pain or inconvenience, racks him day and night with constant torture, and admits of relief only from death, not until the end, it may be, of several miserable years. If I were to relate some of the cases which have fallen under my observation, of patients who perished in this way after being supposed to have been treated with success by the most eminent stone-breakers, the lithotrite would be regarded with more dread than the knife.

Not long ago a gentleman resident in Gibraltar, after suffering long and severely from stone in the bladder, repaired to Paris for the purpose of getting it crushed. He there placed himself under the care of one, and then of another most celebrated operator, but without accomplishing his object, so that, after remaining several months in the French capital, he returned home in a worse state than when he left it. Next year, finding the complaint intolerable, he again set out in

quest of relief; but this time directed his course toward Edinburgh, and desired me to perform the cutting operation. I accordingly did so, and removed two stones, weighing together four ounces, without any pain or subsequent trouble, so that he was soon able to take his departure with every prospect of complete and permanent relief.

But when the stones were subjected to a section, they told their history no less distinctly than unfavorably for the lithotriptic process, since they consisted of two portions—one brown, and obviously com-

Fig. 29.



posed of lithates, which had been the original formation, the other of that white and phosphatic sort which denotes the existence of long-continued catarrhal irritation of the bladder, doubtless caused by the efforts to break the stone in Paris, which fortunately proved abortive, as the fragments could hardly have been removed without still more mischief.

XXXVI.

REMOVAL OF A HAIR-PIN FROM THE BLADDER.

J. F., aged twenty-one, a stout young woman from the country, recommended to my care by Dr. Howden of Haddington, was admitted into the hospital on the 17th of November last, for the removal of a hair-pin which had been introduced into the bladder. It was said

to be of the double kind, about two inches long, with two points at one end and a loop at the other, and could be readily felt on examination by sounding; so that the only difficulty attending extraction appeared to proceed from the risk of seizing the wrong extremity, especially as from being retained several weeks it might be expected to have acquired some degree of phosphatic incrustation, which would make its recognition by the touch of an instrument uncertain.

On the 22d, the patient being rendered unconscious by chloroform, I dilated the urethra by introducing a succession of bougies gradually increased in size, until the point of my finger was admitted into the neck of the bladder, where, feeling the tense resisting fibers situated there, I made a very slight incision hardly more extensive than the blade of a narrow straight bistoury employed for this purpose. The finger then readily entered the bladder and ascertained the position of the pin, into the loop of which a hook was passed, so as to effect the extraction easily and safely. The patient suffered no inconvenience, and in the course of a few days, having completely regained the power of retention, was dismissed.

The point of most interest in this case is the illustration it affords of the advantage which attends a combination of dilatation and cutting for obtaining access to the bladder. Both of these means, when employed separately, are apt to occasion permanent incontinence of urine; while the former of the two, if carried beyond a certain degree, is apt to produce that suppurative inflammation which in this situation so surely proves fatal, whether the sex of the patient be male or female. But if the tense unyielding band is divided by incision, any amount of additional space required may be safely obtained by dilatation, or rather separation of the fibers that compose the texture concerned.

XXXVII.

MALIGNANT TUMOR OF A TENDON.

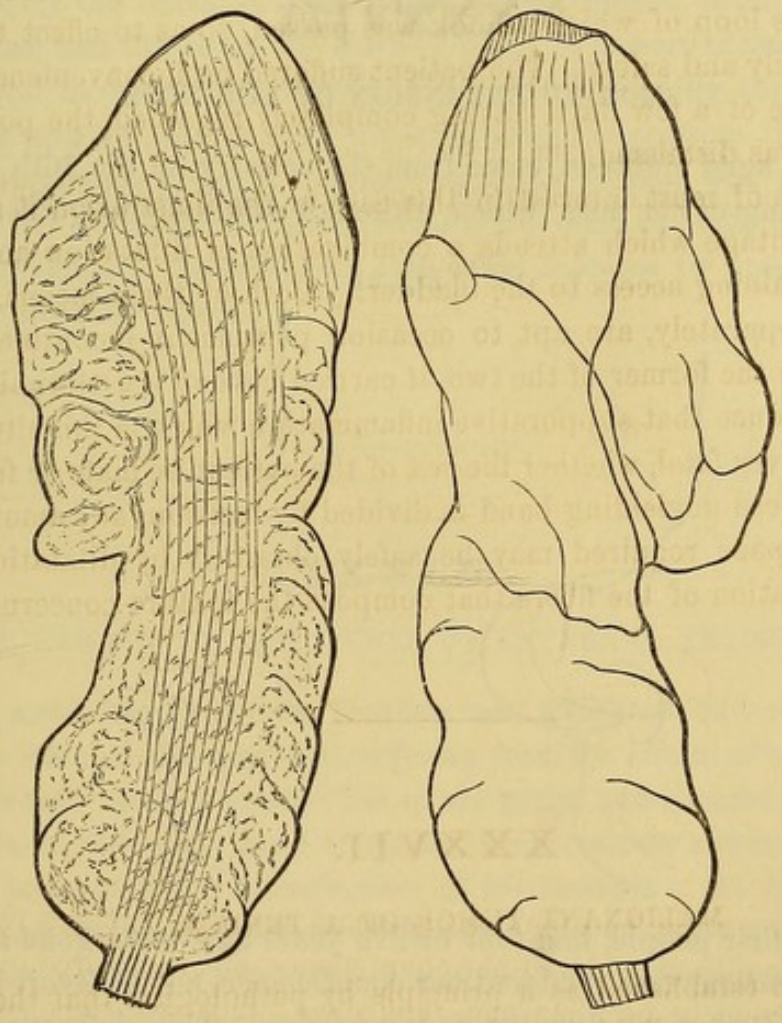
It has been established as a principle by pathologists that the tendinous tissue is not liable to original degeneration of texture, and I subscribed to this doctrine until the following case presented itself to my notice.

J. B., twenty-five years of age, a domestic servant, was sent to me by her master, one of the judges of the Court of Session, on account

of a tumor that had appeared on her fore-arm about six years previously, and been gradually increasing. It lay under the fascia on the front or palmar side, and extended from near the wrist two-thirds of the distance toward the elbow. The form was elongated and irregularly nodulated, the substance moderately firm and elastic, and the mobility slight, only in a lateral or transverse direction. From these circumstances I concluded that the tumor involved the median nerve; and under this impression proceeded to remove it.

Having made a free incision through the integuments, I opened the fascia, and found the tumor at its lower part, presenting a dark-colored, mottled, and shining surface, quite unconnected with the neighboring parts, and having a cord protruding from its extremity.

Fig. 30.



This I divided, supposing it to be the nerve, and expecting to find a similar condition at the other end; but here there was no such distinct definition of the growth, or any cord perceptible, so that some dissection was required to finish the operation. The tumor, which was about six inches in length, having been thus removed quite entire, was

found to possess the form here delineated on a reduced scale, and when divided longitudinally very unexpectedly displayed a tendon instead of the nerve, which had been supposed the seat of its formation. The surface of this section displayed the usual appearance of a cerebriform growth, and the microscope detected corresponding characters.

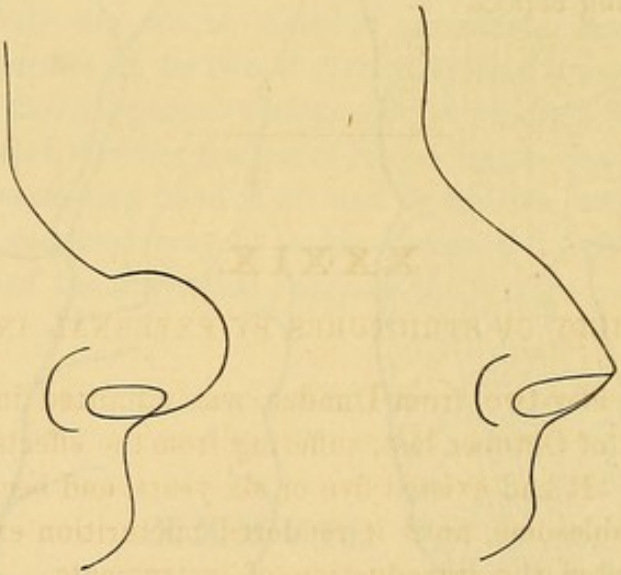
The operation was performed on the 31st of January last. The patient made a good though rather slow recovery, was dismissed on the 25th of March, and soon afterward resumed her duties as housemaid, which she still continues to exercise without any sign of relapse.

XXXVIII.

MORBID EXPANSION OF THE NOSE.

E. M., aged eighteen, came from the country on the 26th of April, complaining of her nose, which, although originally not different from

Fig. 31.



that of other people, had four or five years ago undergone a remarkable alteration, that rendered her countenance, not ill-favored in other respects, extremely peculiar and repulsive. This deformity was an expansion of the extremity into a globular shape, as here very exactly represented, not depending upon enlargement of the skin merely, as happens not unfrequently in the male sex at an advanced period of life, but being a morbid development of all the tissues, so that even the columna was longer than usual.

In the ordinary case of integumental hypertrophy of the nose it is well known that the tumors, no matter how numerous or enormous, may be removed without any inconvenience, since they only require to be shaved off, without taking away the skin through its whole thickness, so that the cutaneous surface which remains cicatrizes with nearly the same facility and rapidity as the one caused by a blister. I have therefore not scrupled to perform operations of this kind even at or beyond the age of eighty, where the growth had become so large as to render existence very uncomfortable, by exciting the ridicule and disgust of those who witnessed it. But the condition of this young woman did not admit of remedy on such a principle, and at first sight seemed an improper subject for interference.

The patient's urgency having led me to reconsider the subject, I resolved to try the effect of removing a wedge-shaped portion of the prominence, and did so on the sixth of May, by means of two decided longitudinal incisions, embracing the projection, passing through the cartilages, and meeting at some distance down the septum. The edges of the wound were brought together by silver sutures, and united so that they left no trace of their existence, the nose not only being rendered very shapely, but allowing the other features to present their naturally pleasing aspect.

XXXIX.

THE REMEDY OF STRICTURES BY EXTERNAL INCISION.

A. L., aged fifty-two, from Dundee, was admitted into the hospital on the 29th of October last, suffering from the effects of a stricture in his urethra. It had existed five or six years, and become progressively more troublesome, until it rendered micturition extremely painful, and prevented the introduction of instruments. At length the scrotum and perineum swelling, with much induration, it was thought proper to send the patient here. On his way the enlargement greatly increased, so as to extend above the pubes, and when he arrived no time was lost in making incisions for the escape of urine, which was evidently extravasated. These openings being free, and in the middle line, allowed the fluid such ready egress as prevented the sloughing that would otherwise have been occasioned, and the swelling speedily subsided.

I then proceeded to remedy the stricture, and soon succeeded in passing bougies through the contracted part of the canal, which was immediately behind or below the scrotum, and carried on the dilatation until instruments of the full size could be introduced. Under this treatment all the wounds healed, except one in the scrotum, which was surrounded by very indurated texture, and allowed more than half of the water to escape. After contending in vain against this obstacle to recovery for several weeks, I tried the effect of keeping a catheter in the bladder, but without any advantage, and should then have felt much at a loss if limited to the means that were in use before I adopted the method of external incision.

On the 10th of January, a grooved director having been passed through the stricture, I cut freely through the thickened and condensed textures, ran the knife fairly through the whole extent of contracted urethra, introduced a catheter into the bladder, and allowed it to remain for a week. Everything went on favorably: the urine passed in a full stream, the fistulous opening closed, and the patient was dismissed cured on the 2d of February.

Case II.

A gentleman nearly sixty years of age, recommended to my care by Dr. Maidstone Smith of Exmouth, came here last spring suffering from a stricture of the urethra, which had existed for more than twenty-five years, and although treated by surgeons of skill and experience, had been long regarded as truly impermeable. I found a fistula in perineo, with great induration extending to the verge of the anus; but on the second day after the patient's arrival succeeded in passing a metallic bougie fairly into the bladder without any pain or a drop of blood. The dilatation was then carried on by successive steps, and with intervals of sufficient length for preventing any undue irritation; but all to no purpose, since the water still dribbled from the orifice of the urethra and escaped in nearly an equal quantity by the fistulous opening, while the patient was distressed by frequent calls to empty the bladder, and continued to have a profuse discharge of mucus. The general health also did not improve, and, on the contrary, seemed to be giving way even more than it had done previously from the long-continued annoyance. At length, after two months had been thus worse than wasted, I divided the stricture by external incision. The patient was at once relieved from all his sufferings; and by the end of three weeks went to London, where I saw him afterward in the enjoyment of perfect health.

Other cases of a similar kind that have occurred, both in public and private practice, within the same period, might be mentioned, to illustrate still further two practical facts which I have long been anxious to inculcate. These are, that in some cases stricture of the urethra will not yield to dilatation, or rather continues to present its symptoms after being dilated; and that in such circumstances a free division of the contracted part by external incision affords effectual relief. Having, in common with all my professional brethren who have been much engaged in this department of surgery, frequently experienced the vexatious opposition of the disease in such a form, I felt great pleasure in communicating an easy method of overcoming the difficulty, and certainly was not prepared for the storm of abuse and misrepresentation which it brought down upon me. Nearly £800 of law expenses, incurred not for prosecuting the libelous attacks that were freely circulated, but in simply defending myself from the persevering litigation of obscure individuals, whose only ground of complaint was that I declined entering into discussion with them, as being beyond the pale of professional respect and courtesy, was one of the fruits derived from my proposal, and may not be unworthy of mention as a curious fact, showing the danger which sometimes attends the introduction of improvements.

In originally proposing the external incision for remedying strictures indomitable by the ordinary means of treatment, I believed that the only sources of danger which could result from this procedure were hemorrhage and infiltration of urine, and that both of these consequences might with certainty be prevented. In these opinions I have been confirmed by a very large experience, in the course of which I never lost a patient from the loss of blood or urinary infiltration.

It may be remarked that, in operating upon strictures anterior to the scrotum, I never introduce a catheter, as it seems to be quite unnecessary, and therefore a useless complication.

There is another point in regard to which my opinion has been considerably modified by experience: this is, the extent to which division of a stricture may supersede the subsequent use of bougies. Originally I expected that the operation would not only afford complete relief from the existing symptoms, but also extinguish the tendency to contraction, so as to render any future treatment unnecessary; and that such may be the result has been fully ascertained. Thus in the very first case of division behind the scrotum, where the patient had suffered for more than twenty years and been reduced to the most extreme distress, being unable either to evacuate or retain the urine, and rendered so wretched as in all sincerity to pray for the termination of his ex-

istence, although during twelve months I had labored in vain to afford relief by dilatation, temporary or permanent, internal incisions, and various combinations of these means—the operation at once restored health and comfort, which have continued without the introduction of instruments. Very nearly twenty years have now elapsed since this salutary change was accomplished, and since then I believe few have more enjoyed life, or do so now, than the well-known and much-respected individual who was the subject of it.

A more recent instance of the same kind which may be mentioned, is that of a gentleman from the neighborhood of Gloucester, who about two years ago was placed under my care by the medical friend who accompanied him. I found a man of naturally strong and energetic system, reduced by suffering to a state of extreme weakness, irritability, and despondency, with great enlargement of the scrotum and perineum, through which the urine passed by fistulous canals, having nearly deserted its proper channel. The patient would not allow me even to examine him except under chloroform; and as in such a case dilatation was quite out of the question, I at once divided the contracted part of the urethra and introduced a catheter. When it was withdrawn at the end of three days, improvement quickly proceeded, and was completed in little more than three weeks, so that the patient then returned home quite a new man; and promising to let the full-sized bougie, which I passed with perfect ease, be introduced occasionally for the prevention of relapse. From the letters of more than one practitioner, I was sorry to hear that this precaution had been neglected, and that the morbid condition was no less distressing than it had been before coming under my care. Not many weeks ago I received a letter of this kind so gloomy, that in replying to it I recommended the operation to be repeated, with greater subsequent perseverance in the use of instruments. A few days ago, finding the card of this gentleman, I concluded that he had come again for my assistance, and upon calling at his hotel, was rather surprised to hear that he had gone upon an excursion to Melrose. But my astonishment was considerably greater next day, when he walked into my room, and cordially shaking hands, exclaimed, "Well, you have made a cure of me." In reply, I rather anxiously inquired, "What sort of a stream could he make?" "It would turn a mill," was the ready rejoinder. Somewhat encouraged, I then asked to see the field of my operation, and found all the parts concerned in the most perfect state of integrity.

It must be admitted, however, that such cases are exceptional, and that in general the stricture will return sooner or later unless the canal be kept dilated by the occasional introduction of bougies or catheters.

But here a difficulty is presented by the comparative rarity of skillful manipulation in the use of urethral instruments, of which the imperfection in most surgical armories shows how little attention is apt to be bestowed on their employment. Thus a gentleman who had been under my care, lately writing at a distance of little more than twenty miles from London, says of three practitioners in his neighborhood, "One has an old bougie made A.D. 1700; another, two or three old-fashioned catheters; and the third, some gum-elastic catheters totally unfitted for the purpose." Such being the case, I think prudence requires that every patient who has had a stricture divided should learn to introduce bougies; since by doing so at intervals of a week or fortnight he will be perfectly secure from future trouble.

EXCISION OF THE SCAPULA

AND

EXCISION OF THE TONGUE.

PREFACE.

In the present advanced state of Surgery, any real addition to its resources must be regarded as a subject of interest, and I therefore venture to hope that the following account of an entirely new operation will be deemed worthy of separate publication.

EXCISION OF THE SCAPULA.

Case I.

On the 18th of September, 1856, an old woman named Janet Scott, about seventy years of age, was admitted into the Royal Infirmary, on account of a large tumor involving the left scapula. In size and form it resembled a cocoa-nut, its consistence in some parts presenting the hardness of bone, and in others being elastic but firm. A distinct aneurismal bruit could be perceived throughout the swelling, which also communicated a strong pulsatory movement to the hand when placed over it. The patient stated that she had first noticed the enlargement about six months before the time of her application, when it was the size of an orange, and had suffered little inconvenience from it until a recent period, when, not only from rapidly increasing, but also from causing painful sensations, it had rendered her unable to discharge the duties of a domestic servant in the country.

As the growth extended into the axilla, it was evidently impossible to afford relief by any partial removal of the scapula, and as amputation of the arm, together with the tumor, independently of the objection that might be expected from the patient to so extensive a mutilation, appeared altogether hopeless of success at her advanced time of life, I took into consideration the practicability of removing the affected bone alone. The tumor, if not aneurismal, was evidently very vascular, and I knew from the previous experience of partial operations, that the removal of the whole bone could not be accomplished without a formidable amount of hemorrhage. On the other hand, I thought there was reason to expect that, if the subscapular artery were secured at an early part of the process, the clavicular and humeral attachments might be separated without much loss of blood, and that then the remaining connections would admit of such a rapid division as to place the cut vessels almost immediately within reach of compression. It also appeared probable that, if the object were thus accomplished without an excessive drain on the patient's strength,

there would not be any other serious obstacle to recovery, or threatening source of danger, and I therefore resolved to perform the operation.

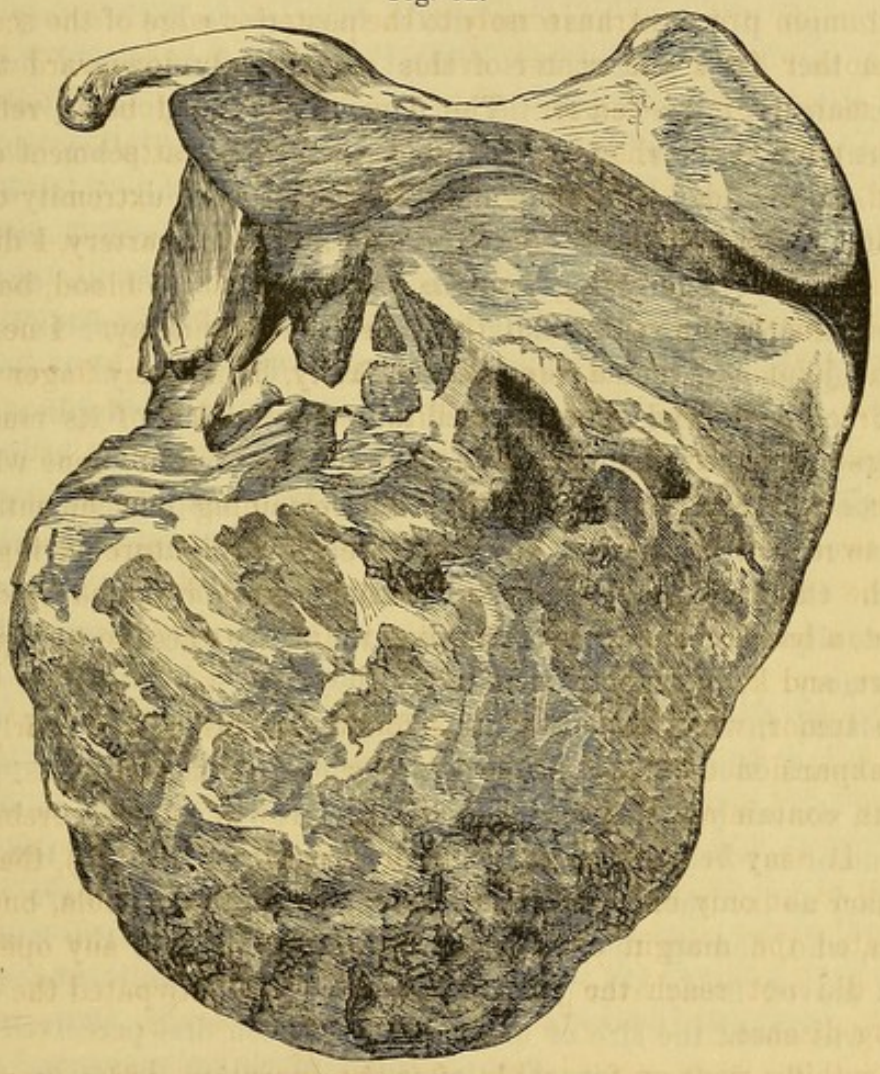
On the 1st of October, the patient being fully under the influence of chloroform, and placed upon her right side, I made an incision from the acromion process transversely to the posterior edge of the scapula, and another from the center of this one directly downward to the lower margin of the tumor. The flaps thus formed being reflected without much hemorrhage, I separated the scapular attachment of the deltoid, and divided the connections of the acromial extremity of the clavicle. Then, wishing to command the subscapular artery, I divided it with the effect of giving issue to a fearful gush of blood, but fortunately caught the vessel and tied it without any delay. I next cut into the joint and round the glenoid cavity, hooked my finger under the coracoid process so as to facilitate the division of its muscular and ligamentous attachments, and then pulling back the bone with all the force of my left hand, separated its remaining attachments with rapid sweeps of the knife. The vessels requiring ligature having been tied, the edges of the wound were stitched together and covered with dry lint, a bandage being lastly applied round the chest to give proper support, and keep the arm in its place.

The tumor, when examined, was found to consist of a nearly uniform expansion of the bone into a bag, partly membranous, partly osseous, containing a soft, very vascular growth of the cerebriform kind. It may be seen from the representation [Fig. 32), that this condition not only extended up to the spine of the scapula, but also implicated the margin of the glenoid cavity, so that any operation which did not reach the joint could not have extirpated the whole existing disease.

Everything went on favorably after the operation, and a great part of the wound healed by the first intention. The discharge, which was at first rather copious and thin, in the course of a few days diminished to an amount so small as to remove all apprehension of its exhausting the patient, especially as she retained a good appetite, even for the porridge which had been her principal article of diet previously, slept soundly, and presented a cheerful aspect. At the end of a fortnight the discharge was reduced to little more than sufficient for staining the bandage, so that it seemed as if complete recovery would very soon be accomplished. But through an opening about an inch in length, where the edges of the transverse incision remained ununited, the head of the humerus could be seen still covered with its cartilage, which, however, in the course of another week

began to disappear, and to give place to granulations gradually extending from the neck over the convexity of the bone; while the cavity at the same time contracted until the humerus and clavicle came nearly into contact, and the shoulder, especially when viewed in front,

Fig. 32.



assumed a wonderfully natural appearance. The patient, who from an early period after the operation had with difficulty been restrained from using the arm too freely, again and again declared that it was in nowise inferior to the sound one, and it appeared, indeed, that through the support afforded by the clavicular portion of the deltoid, together with the action of the pectoralis and latissimus dorsi, the limb would be able to execute a fair degree of motion.

While the local state of matters was thus proceeding in the most favorable and satisfactory manner, it could not escape observation that the patient's strength did not improve in a corresponding degree. On the contrary, without any reason that could be discovered except the decay of old age, she gradually became weaker and more emaci-

ated, though still retaining appetite for food, and performing her bodily functions with so much appearance of health as still to encourage the hope of ultimate recovery. But toward the end of November symptoms of sinking suddenly presented themselves, and terminated in death on the 1st of December.

Although it would have no doubt been more satisfactory if the patient had lived longer, it is evident that the progress of her case was sufficiently advanced for the settlement of some points possessing practical importance. It thus appears, in the first place, that the entire scapula may be disarticulated from the shoulder-joint without loss of blood to any great extent; 2dly, that the wound resulting from this operation does not necessarily occasion an excessive amount of discharge; and 3dly, that the arm which remains is not a useless appendage, but a serviceable limb. The value of these facts will of course depend upon the field admitting of their application to practice; and the extent of this can hardly be determined at present, since morbid conditions, involving the whole scapula having been hitherto regarded as irremediable, may not have seemed deserving of record. One remarkable case, which would have afforded an excellent opportunity for performing the operation, is strongly impressed upon my memory. I allude to that of the boy whose history Mr. Liston has related in his "Elements of Surgery," and more fully in the "Edinburgh Medical and Surgical Journal" for 1820. The patient, a youth sixteen years of age, had come from the country on account of a tumor involving the scapula, and been dismissed from the Royal Infirmary as incurable. He was then placed under the care of Mr. Liston, who, finding that the growth was confined to the bone, and that it moved freely over the ribs, resolved to operate. The tumor, which was about the size of an orange, had been first perceived about three months before, situated immediately below the spine of the scapula, not larger than a filbert, of a flat form, and attended with distinct pulsation. It subsequently increased with great rapidity until it extended from the inferior angle over two-thirds of the scapula. It was uniformly convex, and possessed a very firm consistence, but yielded under strong pressure with a crackling sensation.

The external surface of the tumor was exposed without any difficulty; but when the operator attempted to separate its attachment to the spine of the scapula, such a gush of blood issued as to require the most energetic measures of suppression. The subscapular and other vessels concerned in this hemorrhage having been secured, Mr. Liston sawed across the scapula so as to leave merely its upper portion on a level with about a third part of the spine. The tumor was found to

consist of an osseous shell composed of plates directed from the circumference toward the center, and containing a coagulum of blood in its cavity. It has generally been regarded as an example of osteo-aneurism, but I believe was rather a form of cerebriform disease. Notwithstanding the patient's extreme exhaustion during and immediately after the operation, everything went on favorably until between five and six weeks, when a fungous excrescence appeared at the upper part of the wound. This was removed so as to expose the bone and allow it to be cauterized; but resisted the check thus opposed to its growth, and showed that so long as any portion of the scapula was permitted to remain, there could not be any reasonable expectation of recovery. Mr. Liston therefore proposed to remove the part which had been left at the former operation, together with the arm, but could not obtain the sanction of any surgeon in Edinburgh for such a formidable proceeding, and did not feel warranted to undertake it upon his own responsibility. Nothing therefore was done, and the patient, after lingering in great misery and being finally exhausted by repeated hemorrhages, died five months after the operation.

Case II.

T. G., aged forty-three, from Alva, was admitted into the hospital on the 9th of November, 1860, suffering from a tumor of the right shoulder. It was situated under the deltoid, being about the size of a hen's egg, divided longitudinally, and having a very firm consistence, hardly distinguishable from that of the bone, to which it was inseparably attached. The patient stated that he had felt pain in the bone about six months before, and had not noticed the swelling until a considerable time afterward, since which it gradually increased in size, with a corresponding aggravation of pain.

Unwilling to propose amputation at the shoulder-joint for a condition so little formidable in appearance—while there could be no doubt that this severe measure would in course of time become requisite, if the disease were allowed to advance until it assumed a more serious aspect—I considered the practicability of affording relief in another way, and took for my guide the principle of practice which has been so well established in regard to tumors of the jaw, that nothing more is required for an effectual remedy in all curable cases than removing the morbid growth, so as to divide the bone in a sound part beyond the confines of the disease. The cases of maxillary tumors, which, when formerly treated by means of gouges and cauteries, applied directly to the seat of disease, uniformly proved miserable failures, are

now remedied with such facility and certainty as contrast very favorably with the inefficiency of surgery in this department at no very distant date. Having thus reason to expect that removing the upper extremity of the humerus would be sufficient for the purpose, and knowing from the results of similar operations for caries that the arm, notwithstanding this shortening of the bone, would not be materially lessened in usefulness, I adopted the following procedure:

On the 14th I made an incision from the coracoid process downward to the extent of about four inches, opened the joint, separated the muscular attachments from the tuberosities of the humerus, protruded the head of the bone through the wound, and sawed it off below the tumor, which was found to consist of a thick cyst, partly osseous at the base, and containing small cysts in its substance, resting on a rough, slightly excavated surface. No vessels required to be tied, and the patient suffered hardly any local or constitutional disturbance. He was dismissed on the 4th of January, 1861, and I saw him some months afterward in perfect health, with the wound soundly healed, and an arm strong and useful from the elbow downward.

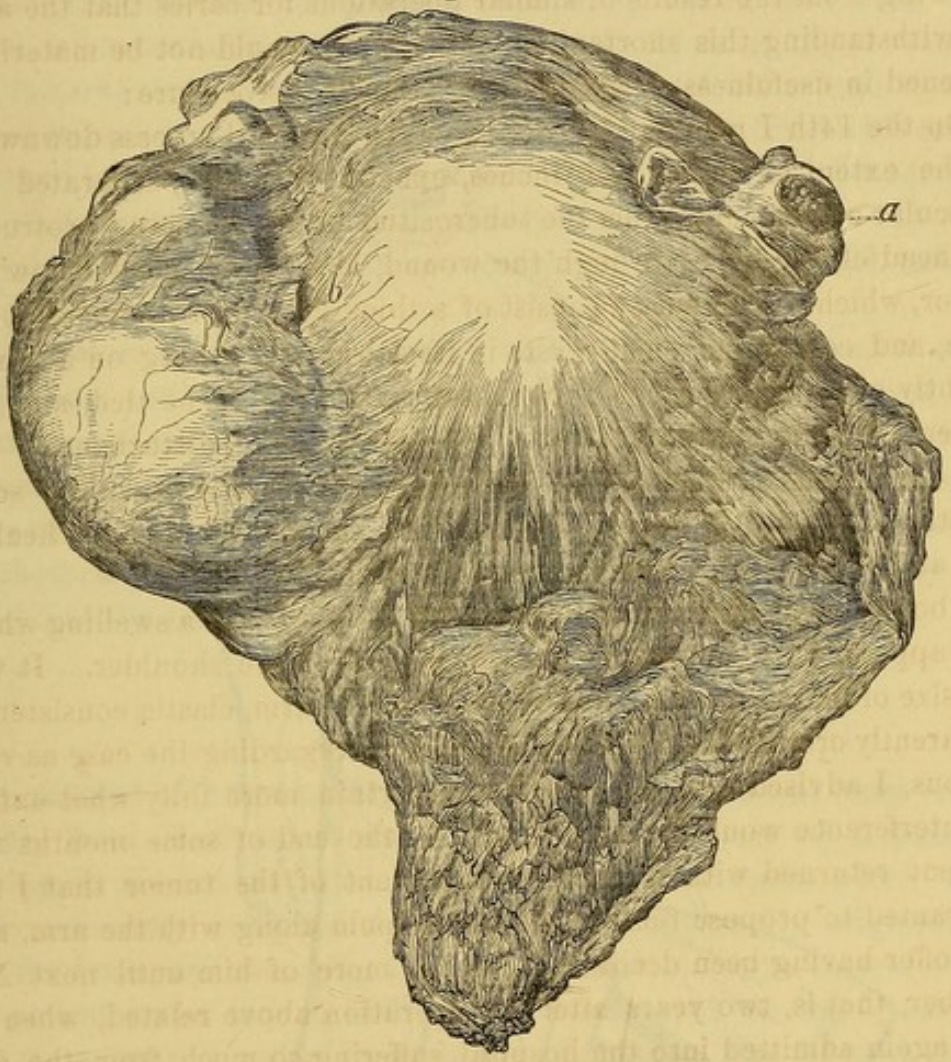
About a year afterward, my attention was called to a swelling which had appeared on the upper and back part of the shoulder. It was the size of an orange flattened in form, and of firm, elastic consistence, apparently originating from the scapula. Regarding the case as very serious, I advised delay, in order to ascertain more fully what extent of interference would be requisite. At the end of some months the patient returned with so much enlargement of the tumor that I felt warranted to propose removal of the scapula along with the arm, and this offer having been declined, I saw no more of him until next November, that is, two years after the operation above related, when he was again admitted into the hospital, suffering so much from the disease as to desire whatever might be thought necessary for his relief.

The tumor was now very large, presenting a convex surface over nearly the whole extent of the scapula, and completely filling the axilla, where it had swelled into two great round masses lying before and behind the vessels, so that any partial removal of the bone was quite out of the question. But having reconsidered the subject, and especially taken into account the perfectly sound state in which the arm-bone remained, notwithstanding the unhealthy action that had been going on in its immediate neighborhood, instead of the extensive mutilation formerly contemplated, I resolved to remove the scapula alone, in hopes of saving the arm.

On the 13th of November the operation was performed as in the case which has been related, with the exception of taking away a

portion of the clavicle to facilitate the procedure. I began by making an incision from that bone a little to the inner or sternal side of the coracoid process, directed downward through the whole extent of

Fig. 33.

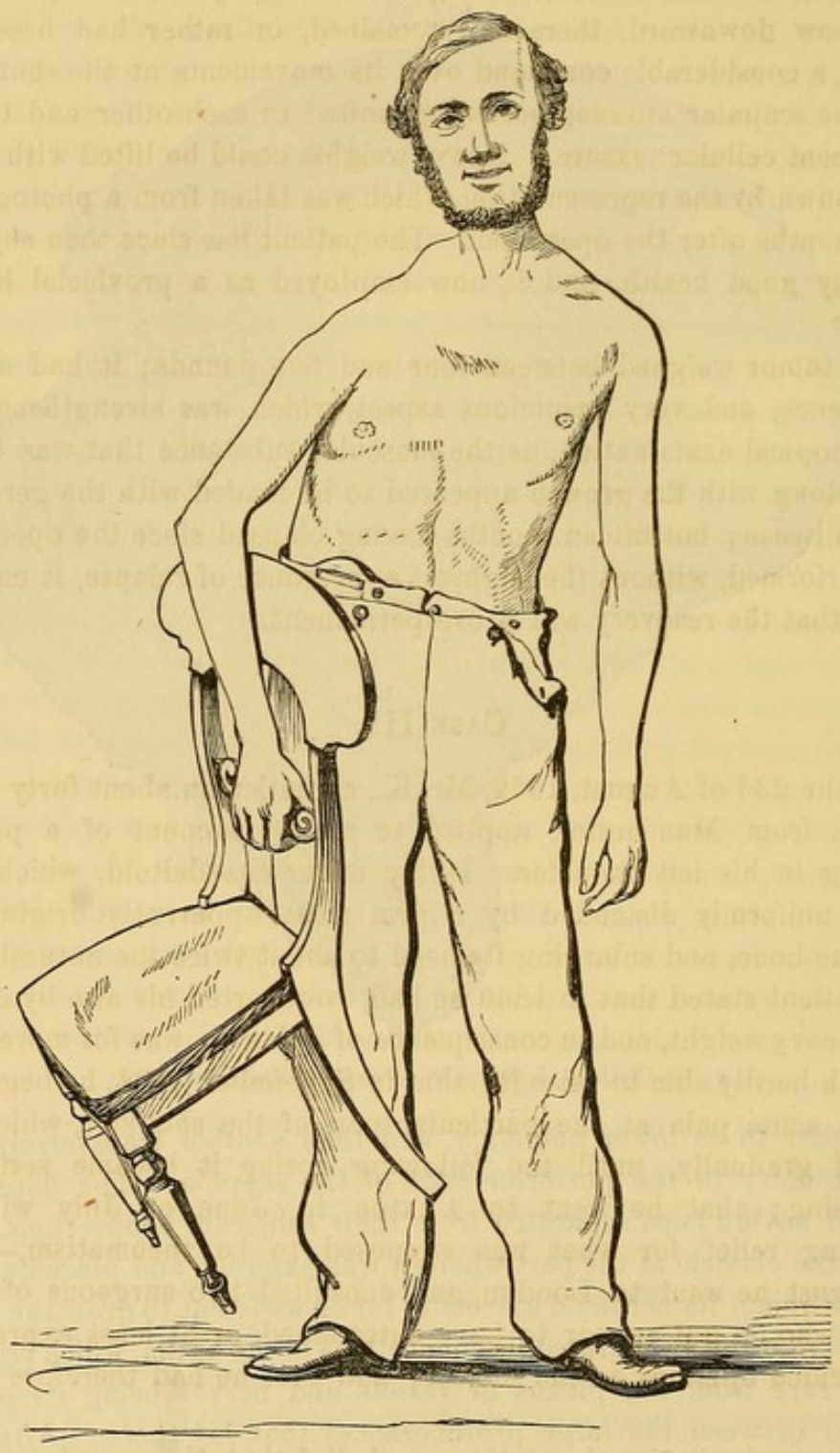


a. The Clavicle. *b*. Sulcus in which the axillary plexus lay.

the tumor to its lower boundary, and then another transversely from the shoulder to the posterior edge of the scapula. The flaps thus formed having been separated from their subjacent connections, I divided the clavicle at the part where it was exposed, and placed a piece of cord round its acromial extremity for an assistant to draw the tumor backward while I separated its connections in the axilla, which required great care from the plexus of vessels and nerves being deeply imbedded between the large protuberances that lay there. After this had been accomplished, and the subscapular artery secured, the subsequent part of the operation was easily performed, by dividing the muscular attachments. The edges of the incisions were then stitched together by silver sutures and supported by a bandage.

There was neither so much difficulty nor so much bleeding in the operation as had been anticipated, and the patient, on awakening

Fig. 34.



from his chloroform slumber, did not appear in any respect different from what he had done previously. He suffered no local or constitutional disturbance; the next morning was observed to use the arm in

taking his breakfast; and before the end of three weeks was able to write a letter with it. Everything went on well afterward, so that in six weeks the recovery might be considered complete. It was then seen that while the limb retained perfect mobility and strength from the elbow downward, there still remained, or rather had been acquired, a considerable command over its movements at the shoulder, from the scapular muscles becoming united to each other and to the interjacent cellular texture. Heavy weights could be lifted with ease, as is shown by the representation, which was taken from a photograph some months after the operation. The patient has since then enjoyed perfectly good health, and is now employed as a provincial letter-carrier.

The tumor weighed between four and five pounds; it had a soft consistence, and very suspicious aspect, which was strengthened by microscopical examination, as the muscular substance that was taken away along with the growth appeared to be loaded with the germs of future disease; but fifteen months having elapsed since the operation was performed, without the slightest appearance of relapse, it may be hoped that the recovery will prove permanent.

Case III.

On the 23d of August, 1862, Mr. K., a gentleman about forty years of age, from Manchester, applied to me on account of a painful swelling in his left shoulder. It lay under the deltoid, which was nearly uniformly distended by a firm mass apparently originating from the bone, and enlarging its head to about twice the natural size. The patient stated that in 1860 he had overexerted his arm by carrying a heavy weight, and in consequence of doing so, was for more than a month hardly able to raise it; that in September, 1861, he began to feel an acute pain at one particular part of the shoulder, which increased gradually, until the following spring it became seriously distressing; that he went to Buxton in June or July without obtaining relief for what was supposed to be rheumatism,—that in August he went to London, and consulted two surgeons of eminence, who do not appear to have entertained, or at least expressed, any decided opinions on the subject; and that he had therefore come to me.

I felt no hesitation in stating my belief that the symptoms proceeded from a morbid growth of the bone, and did not admit of remedy except by removal of the part affected, but to avoid any risk of unnecessary interference from the disease being merely periosteal, advised

the application of one or two blisters and small doses of the iodide of potassium. On the 16th of September, finding that there had been no improvement under this treatment, I proceeded to cut out the head of the humerus, as in the case last related, with the effect of removing a fibro-cartilaginous growth not affecting the joint, but extending round the bone, and presenting an irregularly tuberculated or nodulated surface. The patient suffered no local or constitutional disturbance from the operation, and on the day three weeks from the time of its performance, was able to take a carriage-drive.

The arm soon became strong and serviceable, so that the recovery was deemed complete and permanent. But, early in January, 1863, a tumor was felt under the cicatrix, and suggested another visit to me.

Finding this new growth, which was about the size of a large walnut, quite movable and unconnected with the bone, I at once removed it, and found a thick fibro-cartilaginous cyst, with serous contents. The wound quickly healed, and we again hoped that the disease was eradicated. But very soon afterward I was sorry to hear that a more formidable attack was threatened in the scapular region, where a large growth had become rapidly developed, extending into the axilla, and overlapping the end of the humerus. The opinion of Mr. Paget was then taken, and being strongly favorable to another attempt, I agreed to undertake it, but as the patient naturally felt averse to another long journey under such distressing circumstances, he requested me to perform the operation at Manchester, which I accordingly did on the 7th of May, assisted by Messrs. Smith and Beever of that city, and Mr. Annandale, who accompanied me.

As the arm, unfortunately, could not be preserved, instead of cutting in a crucial form, I made two semilunar incisions from the acromion process downward, one on each side of the joint, and terminating at the lower angle of the scapula. The integuments were then dissected back so as to expose the tumor and afford access to the clavicle, which was divided by the saw and cutting-pliers a little nearer the sternum than the coracoid process. The scapular extremity of the clavicle being now held forcibly backward, I divided the pectoral muscles, blood-vessels, and nerves, tied the axillary artery, and lastly, by free use of the knife quickly separated the remaining muscular attachments, so as to complete the operation without much delay or loss of blood, although no fewer than nineteen ligatures were required. The tumor, which presented precisely the same characters as those of the former growths, adhered inseparably to the glenoid cavity, neck of the scapula, and acromion process; thus rendering any less decided measure than the one adopted inadequate for the purpose.

Everything went on satisfactorily after the operation; the wound—of which the edges had been stitched together and supported by a bandage—healed so well, that at the end of three weeks the patient was out driving, and soon afterward completely regained his usual good health. During the summer and early part of autumn there was occasionally a slight oozing of matter from the lower extremity of the incision, which was finally accounted for by the discharge of a very small scale of bone, since when all the parts concerned have been perfectly sound, and the patient, the last time I heard from him, had been following the hounds.

From what has been said, it appears,—

1st. That the entire scapula, either alone or together with the arm, may be removed without much difficulty or loss of blood.

2d. That the wound thus inflicted may heal quickly and soundly.

3d. That the arm, if preserved, may be strong and useful.

I therefore trust that the excision of the scapula will be recognized as a legitimate and established procedure of surgery.

EXCISION OF THE TONGUE.

[From the London Lancet of February 4th, 1865.]

Some years ago I endeavored on two occasions to afford relief from disease of the tongue, otherwise incurable, by cutting out the entire organ; but, as both cases terminated unfavorably, I felt no desire to repeat the experiment, and have repeatedly declined doing so under circumstances of a very urgent character.

In the early part of November last Mr. W., aged fifty-two, from Manchester, applied to me on account of a very formidable morbid condition affecting his tongue. From its point to the root it was swollen and indurated, the surface being of a brown color and roughly tuberculated, so as to resemble the back of a toad. It was also nearly quite immovable, and, from completely filling the mouth, not only prevented articulation, but rendered deglutition impossible with respect to solids and extremely difficult with respect to fluids. From the same state of matters, there was a most offensive fetor through mucus secreted by the unhealthy surface not being permitted to escape.

The patient informed me in writing that he had suffered from uneasiness in his tongue for many years, but that neither articulation nor deglutition was seriously affected until 1862, since which time he had been under medical treatment in London as well as Manchester, without experiencing any benefit. As palliation seemed all that could be expected, I offered some suggestions with this view, and advised that no time should be lost in returning home. But soon after his arrival there I began to receive from the patient very painful letters, reporting aggravation of the symptoms especially in regard to deglutition, so that death from starvation seemed imminent, and urgently desiring some means of relief. To these appeals I replied that the only effectual remedy was removal of the tongue, and that this could not be done without very serious danger to life, so that the operation promised nothing more than a chance of escape. This slight encouragement brought the patient back, and he arrived here on the 27th of December.

Being thus as it were compelled to make another trial of excision, I carefully considered all the circumstances concerned that might tend to interfere with its successful performance. Of these the one which most prominently suggested itself was the prevention of voluntary deglutition, that must result from depriving the os hyoides of the power by which it is drawn forward. In the common cases of cut-throat, where a large transverse wound is made into the pharynx, although the suicide rarely accomplishes his object in the first instance, he still more rarely escapes the fatal effect of pulmonary inflammation induced by irritation propagated from the larynx; and I did not forget that both the patients on whom I had performed the operation in question died from purulent effusion into the lungs. Instead, therefore, of cutting through all the muscles of the os hyoides, as had been done in the former cases, I resolved to retain the mylohyodei and geniohyodei entire, and divide merely the attachments of the geniohyoglossi. I also thought it would be better to perform the operation without chloroform, since the patient, instead of lying horizontally, might thus be seated on a chair so as to let the blood run out of the mouth, and not pass backward into the pharynx. The operation was performed on the 29th, with the assistance of Mr. Annandale, Dr. Sewell, and Mr. Cheyne, to the first of whom I am especially indebted for his able co-operation. Having extracted one of the front incisors, I cut through the middle of the lip, and continued the incision down to the os hyoides, then sawed through the jaw in the same line, and, insinuating my finger under the tongue as a guide to the knife, divided the mucous lining of the mouth, together with the attachment of the geniohyoglossi. While the two halves of the bone were held apart, I dissected backward and cut through the hyoglossi along with the mucous membrane covering them, so as to allow the tongue to be pulled forward and bring into view the situation of the lingual arteries, which were cut and tied, first on the one side and then on the other. The process might now have been at once completed had I not feared that the epiglottis might be implicated in the disease, which extended beyond the reach of my finger, and thus suffer injury from the knife, if used without a guide. I therefore cut away about two-thirds of the tongue, and then, being able to reach the os hyoides with my finger, retained it there while the remaining attachments were divided by the knife, in my other hand, close to the bone. Some small arterial branches having been tied, the edges of the wound were brought together and retained by silver sutures, except at the lowest part, where the ligatures were allowed to maintain a drain for the discharge of fluids from the cavity.

Next day I visited the patient, and finding him in all respects comfortable, inquired if he could swallow. In reply he pointed to a drinking cup containing milk, and intimated that he wished it to be filled; then, placing the spout between his lips, while his head was bent backward, he drank the whole without any cough or sputtering. Having seen this, I felt assured that the result would be satisfactory, and was not disappointed, as everything went on well afterward. The only inconvenience experienced was from the edges of the jaw being occasionally displaced; but this was easily remedied by an ingenious contrivance of Mr. Wilson, the dentist, who, finding that a silver cap inclosing the teeth was not sufficient for the purpose, fashioned a shield of gutta-percha, embracing the chin on each side, and secured to the metal plate by a wire.

Under an ample supply of nourishment by milk, soup, and soft solid food, there was a rapid return of strength, so that an improvement in this respect was almost daily observable, and before the end of three weeks the patient declared that he had never felt better in his life. He returned to Manchester on the 23d of January.

Excision of the tongue has thus afforded complete relief in a case of the most formidable and distressing disease. How far the relief thus obtained may prove permanent, and how far it may admit of being extended to cases of a similar kind, are questions that can be determined only by experience. But the frequency of malignant growth affecting the tongue in an otherwise sound state of the system urgently requires the truth to be ascertained in regard to the value of a remedial measure; and if the operation is now, as I trust it has been, freed from the chief danger attending its performance, facts sufficient for the purpose will probably ere long be accumulated.

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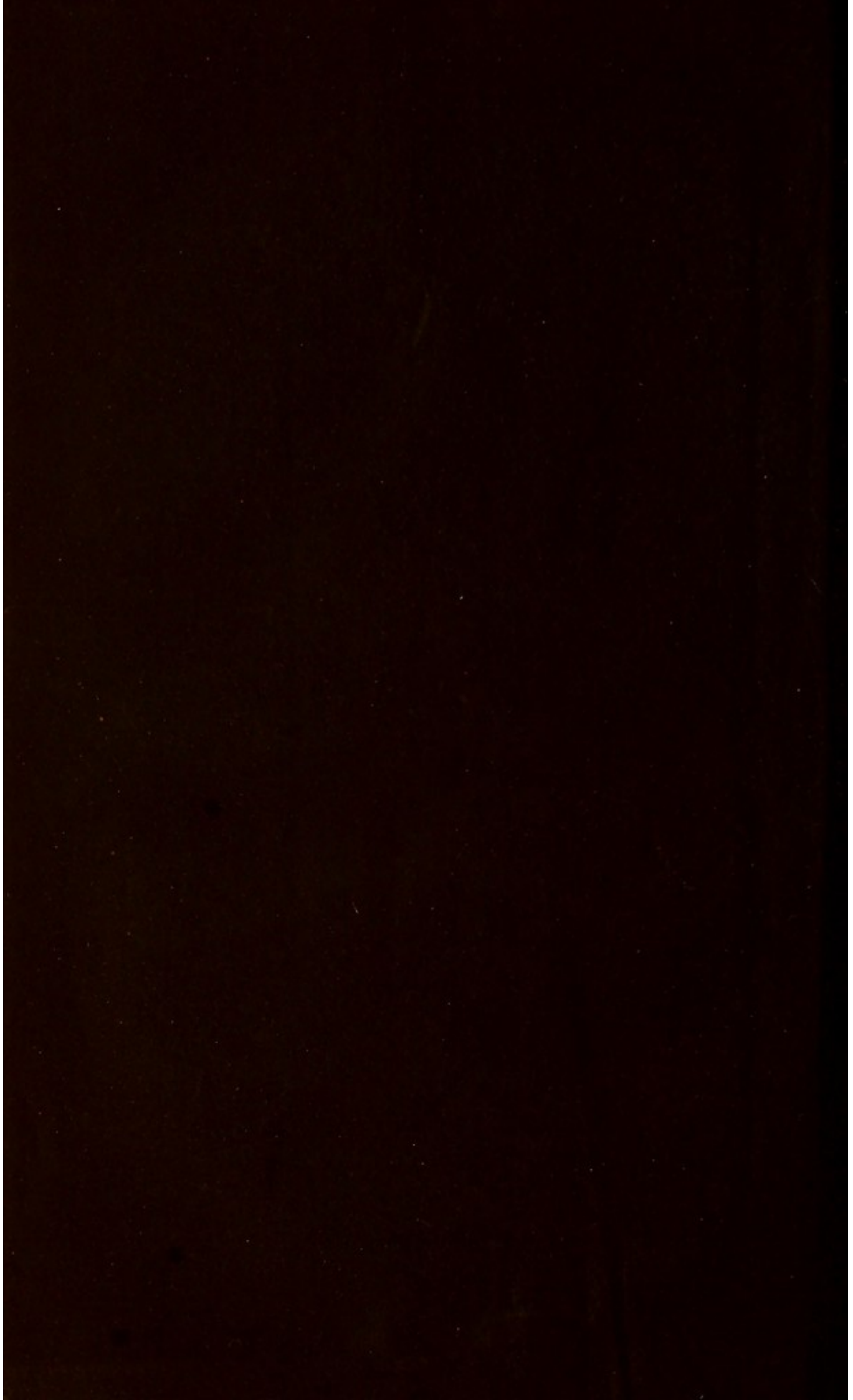
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